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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

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EDITORS

R. C. BENEDICT
W. R. MAXON
E. J. WINSLOW
C. A. WEATHERBY

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Vol. 24 January-March, 1934 No. 1

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American Fern Journal

VOL. 24 JANUARY–MARCH, 1934 No. 1

More Fern Notes from California

JOSEPH EWAN

Since my recent summary of activities in southern California (1931) a remarkable array of new records and notes have accumulated resulting in the present paper. To my own findings are added those of several local fern students by their kind cooperation. This paper also discusses some published accounts of many years' standing and I have endeavored to validate statements made herein by examination of the material or original description concerned.

To the many fellow students and friends who have granted permission to examine collections under their charge or to publish notes therefrom, or who have in any way contributed to this paper, I express my sincere thanks. To Dr. Carl Epling, of the University of California at Los Angeles, Mr. F. R. Fosberg, now of the University of Hawaii, Miss Bonnie Templeton, of the Los Angeles Museum, Mr. G. L. Moxley, Mr. E. L. Peterson, Mr. Louis C. Wheeler, and especially to Dr. A. L. Grant and to Dr. P. A. Munz, who offered many suggestions, I am indeed grateful.

The following abbreviations are employed for the herbaria cited:
University of California at Los Angeles (UCLA)
Pomona College, Claremont (P)
Los Angeles Museum (LAM)
Ewan Herbarium (E)

[Volume 23, No. 4, of the JOURNAL, pages 105–136, plate 6, was issued March 8, 1934.]

The notes gleaned from the Ida Teed Collection, recently donated to the Herbarium of the University of California at Los Angeles, are mainly of interest as records made in San Diego County in 1888.

"*Adiantum chilense* Kaulf." in Bolander's "Catalogue" (1870) is the following species and so separated by Müller (1864).

ADIANTUM JORDANI C. Müll. San Miguel Mt., San Diego Co., *Teed* in 1888 (UCLA). For a description of this and other localities in this county see the account of Laura Kimball (1911).

ADIANTUM PEDATUM L. var. ALEUTICUM Rupr. Can now be reported for the first time from the San Jacinto Mts. upon a collection from "Marion Creek" above Strawberry Valley, 5700 ft., *Peterson* in 1932 (E) where it is fairly common locally. The earliest record for this part of the state and one generally overlooked is "Mount San Bernardino," *W. G. Wright* (Eaton, 1880), possibly identical geographically with Snow Canyon station of Parish (1917) or with the Falls Creek station cited by Ewan (1931). The discovery of the Little Santa Anita Canyon station should be credited to McClatchie (1895) rather than to Moxley, its rediscoverer, as given in my last paper (1931).

ASPLENIUM VESPERTINUM Maxon. Apparently the first collection clearly made at the type locality (San Miguel Mt., San Diego Co.) is *Teed* in 1888 (UCLA). First reported from San Gabriel Mts., Los Angeles Co., by McClatchie (1894) and the following year specifically designated "Millards and Little Santa Anita Canyons" of that range (1895).

CHEILANTHES CALIFORNICA Mett. This fern was first reported from Santa Catalina Island by Brandegee (1890), but its occurrence was doubted by Millspaugh and Nuttall (1923). It may be positively credited to

the island however by the recent collections of *Dunkle* (P), from Empire Landing, Johnson's Canyon, and Renton Mine Hill.

CHEILANTHES CLEVELANDII Eaton. Wiggins (1932) records a station for this fern at 4000 ft. elevation in San Diego Co. A second such record is: "near Montezuma Mines, Montezuma Valley," *Cota 132* (E). Also collected at San Miguel Mt., *Teed* in 1888 (UCLA).

CHEILANTHES VISCIDA Davenp. This fern has long been known from the Panamint Mts. of Inyo Co., but to my knowledge has not been reported from the "Mohavan Area" (Jepson, Man. 12, 1925). Collections have been examined from the Granite Mts., east of Victorville, San Bernardino Co., *Jaeger* without no. or date (P), *Fosberg* in ? 1928 (LAM), and *Wheeler 417* in 1931 (Wheeler Herb.). A fourth station for this rather rare species for San Diego Co. is Palm Canyon of the Borego, *Templeton 1647* (LAM).

CRYPTOGRAMMA ACROSTICHOIDES R. Br. The Munz record noted in my last paper (1931) from San Jacinto Peak, Riverside Co., is antedated by a collection from this high altitude station of *A. Davidson* in 1896 (LAM).

CYSTOPTERIS FRAGILIS (L.) Bernh. This fern is more frequent in our area than formerly believed. It was first recorded from the San Gabriel Mts., Los Angeles Co., by McClatchie (1894) and the following year credited specifically to Little Santa Anita Canyon where it persisted at the probable original station until its extinction was reported by the author (1931). During my recent botanizing in the range, however, I noted it on the north slope of Monrovia Peak in 1933, and collected it on upper Tujunga Creek, *Ewan 7275* (E), above Horse Flats, Pine Flats region, *Ewan 7343* (E), and from Millard's Canyon, *Ewan 7579* (E). Recorded from Santa Barbara Co. (perhaps rather "Ventura Co."

—Mt. Pinos region—cited by Munz & Johnston (1922)) by Orcutt (1886) and Yates (1887).

MARSILEA VESTITA Hook. & Grev. This fernwort ranges from sea-level through the Upper Transition Zone in southern California, and may now be positively credited to the San Bernardino Mts., although Davidson and Moxley (1923) had mistakenly so recorded the plant nine years before its first known collection in that range. "Heavy soil of dried pool," Barton Flats, Santa Ana River drainage, 6500 ft., *Wheeler 1235* (UCLA, E) and "plants extremely abundant in and about a desiccated pond or small lake," valley s.e. of Baldwin Lake, Bear Valley, 7000 ft., *Peirson 10674* (E).

NOTHOLAENA CALIFORNICA Eaton. Two additional stations for the San Gabriel Mts., both at an elevation of 1000 ft., are: San Gabriel Canyon, 6 miles from the mouth, *Wheeler 878* (E) and Rogers Canyon, *Wheeler 955* (E). A sheet labeled "dry rocky ledges," San Bernardino Mts., *W. G. Wright* without date or no. (LAM 4765) would indicate its presence in that range or perhaps along its desert skirt. It is interesting to note the "simulism" (Jepson, Man. 19. 1925) between an Old World xerophytic fern of another genus and our *Notholaena californica*. *Cheilanthes albofusca* Baker. (*C. Mairei* Brause) from Yunnan, China, *Maire 6558* (UCLA), is strongly suggestive of our fern in size and shape of the fronds, though the Chinese species is sometimes larger-fronded, as shown by *Ducloux 1340* (UCLA).

NOTHOLAENA JONESII Maxon. "Shaded crevices in dry sunny granite cliff," Little Rock Creek, San Gabriel Mts., 3500 ft., *Wheeler 1475* (Wheeler Herb.), constitutes another station for this rarity.

NOTHOLAENA NEWBERRYI Eaton. The earliest mention for the San Gabriel Mts. is that of McClatchie

(1894), while the first definite locality (Echo Mt., Mt. Lowe area) was published by the same observer (1895). Davidson (1896) added Eaton Canyon and Munz & Johnston (1922) cited Rubio Canyon. Hence the fourth known station is Fish Canyon, 1000 ft., *Wheeler 1412* (P) where it grows in "dry sunny crevices in metamorphic rock." A collection from San Diego, *Sheldon* in 1902 (E) is aptly labeled "Flannel Fern."

NOTHOLAENA PARRYI Eaton. Not listed from San Diego Co. by Wiggins (1932) but reported by the Parish Bros. (1882) for the desert areas of San Diego and San Bernardino counties. An unreported station for the Mohave Desert is west end of the Sheep Hole Mts., San Bernardino Co., *Fosberg 7961* (E).

PELLAEA ANDROMEDAEFOLIA (Kaulf.) Fée. Reported by Greene (1885) from the Coronados Islands, Lower California, and recently collected on the steep e. slope of South Island, *Fosberg R121* (LAM). For a succinct description of the islands see Grinnell & Daggett (1903).

PELLAEA BREWERI Eaton. First record for southern California was made August 3, 1932, by F. R. Fosberg! Northwest ridge of Sugarloaf, San Bernardino Mts., *Fosberg 8618* (P, E). Known up to this date only south to the Panamint Range (Contr. U. S. Nat. Herb. **4**: 227). The occurrence of two Sierran plants upon Sugarloaf as the only station in southern California is of peculiar interest (*Podistera nevadensis* (Gray) Wats. being the other plant sharing this singular distribution (Ann. Mo. Bot. Gard. **17**: 254) and likewise present in extremely few individuals). An excellent illustration of this fern is plate 40 of the Botany of the King Expedition, 396. 1871. The Sugarloaf specimens are fertile; fronds 3 to 4 cm. long; pinnae characteristically "mitten-shaped"; rachis finely glandular hairy; and plant reduced in all its parts.

PELLAEA BRIDGESII Hook. The record of Davidson & Moxley (1923), the only one from our area, must always remain hypothetical. Mr. Moxley explains that the fern was brought down from Dalton Canyon by a friend and grown for a time in his brother's garden in Covina, and that at the time it seemed referable to this species but no specimen was preserved.

POLYPODIUM SCOULERI Hook. & Grev. Two reports for this fern for Santa Cruz Island of the Santa Barbara group appeared in 1890, that of Brandegee (Zoe **1**: 147) and of Yates (Bull. Santa Barbara Soc. Nat. Hist. **1**: 9 of no. 2). Doubt as to the authenticity of the records from this and Santa Catalina Island (where it is yet to be authentically collected) increased until Munz & Johnston (1922) definitely excluded the fern from the southern California flora. I have recently examined, however, a collection from Santa Cruz Island which is decisively this species—*Yates* in August 1893 (LAM). Another sheet from "rocky cliffs," Valdez Harbor, Santa Cruz Island, *A. L. Grant 1718* in 1923 (P), is certainly this species. Hoffmann (1932) records a collection made at the same locality, *Hoffmann 62* in 1930 (P), but his material is not typical for this fern and partakes of the characters of *Polypodium vulgare* L. var. *Kaulfussii* (Eaton) Fern., which also occurs on the island. Another similarly doubtful collection from this island is that of *Jones* in 1924 (P), nevertheless upon the first two collections it seems wholly justifiable to include *P. Scouleri* as a part of the island flora. As pointed out by Millspaugh & Nuttall (1923), there seems to be no evidence that this species has ever been collected on Catalina Island. There is, however, an interesting and commonly overlooked record for *P. Scouleri* to the north of Santa Cruz Island and south of its known

range in Santa Cruz Co., namely, "an outlying islet in San Luis Obispo Co.," Yates (1902).

POLYPODIUM VULGARE L. var. HESPERIUM (Maxon) Nels. & Macbr. The fourth and hitherto unreported station for the San Jacinto Mts. is Tahquitz Creek below Tahquitz Valley, 7500 ft., *Peterson* in 1931 (E), where it grows in rock crevices near the stream and perhaps represents plants carried down by a freshet from the summits above where it has long been known to occur (Munz & Johnston, 1922).

POLYSTICHUM ACULEATUM (Sw.) Roth var. DUDLEYI (Maxon) Jepson. The range of this fern, known from the "Santa Cruz Peninsula region," may be extended to San Luis Obispo Co., upon the collection of *Mohr* in 1911 (LAM) without statement of definite locality in the county.

POLYSTICHUM MOHRIOIDES (Bory) Presl var. SCOPULINUM (Eaton) Fern. The first record for the San Jacinto Mts. and the fourth collection for southern California is a single sterile plant growing in a deep rock crevice on the north side of Tahquitz Peak, 8000 ft., Riverside Co., *Peterson* in 1931 (E). This latest material more nearly resembles *Peirson 2464* (E) from the San Gabriel range than that seen from the intervening San Bernardino Mts. in having only a few hair-like scales on the rachis, in its distinctly smaller fronds, and in having the pinnae scarcely pinnatifid. The *Peterson* collection measures in the largest frond 55 mm. in the blade; the *Peirson* material, 70–90 mm., whereas specimens from Snow Canyon, San Bernardino Mts., *Peterson* in 1929 (E), measure 170–220 mm. in the blade. The whole aspect of the first two collections is noticeably different from the San Bernardino Mts. collections examined.

PTERIDIUM AQUILINUM (L.) Kuhn var. PUBESCENS

Underw. Apparently unreported from Santa Catalina Island where it grows in three localities, from one to eight feet tall, according to the labels on two *Trask* collections from Avalon in 1902 and 1903 (LAM).

WOODSIA OREGANA Eaton. The range as given by Maxon (1923) should .be extended south to San Pedro Martir of Lower California (Zoe **4**: 210. 1893).

WOODWARDIA CHAMISSOI Brack. Growing along a creek bank which drains the once-extensive peat bogs of Orange County! Westfall near Huntington Beach, about sea-level, *Ewan 4758* (E), where it is associated with *Apium graveolens*, *Hydrocotyle verticillata*, and *Galium trifidum* var. *subbiflorum*, topped by the spires of *Typha angustifolia*.

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LOS ANGELES, CALIFORNIA.

Some Folk-Lore of Ferns

The two extracts which follow are from Sir James George Frazer's *Garnered Sheaves* (1931), the first from pages 107–109, the second from pages 124–127. They are here reprinted with the kind permission of the publishers, Messrs. Macmillan & Co. For the rest, they speak, most attractively, for themselves.

"In a German story a prince comes to a castle where all the people are fast asleep. In a hall of the castle he finds a table, and on the table a golden ring. A silver inscription on the table declares that whoever puts the ring in his mouth will understand the language of birds. Afterwards the prince puts the ring in his mouth and thus. by understanding what three crows are saying, he is saved from death and recovers his eyesight.

"(b) A Swabian legend says that three witches of Heiligenthal culled simples in the woods and fields, and one of these simples imparted a knowledge of the language of animals. In an Italian story a man, plucking some grass at random, suddenly finds that he understands what the birds are saying. He hears one of them tell where a treasure is to be found. He then drops the grass and immediately ceases to understand the birds: he looks for the grass but never finds it again. However. he finds the treasure in the place described by the bird. In a Esthonian story a girl has learned in her youth the language of birds from an old woman, and her eldest sister imparts a knowledge of the bird language to a prince by giving him to eat a cake composed of meal, pork, and certain herbs, the magic virtue residing in the herbs. In Brittany there is a plant called the golden herb (herbe d'or) because it shines from afar like gold. If any one happens to tread on it, he at once

falls asleep and understands the language of birds, dogs, wolves, and so on. The plant is seldom found and never but at the peep of dawn; it can be gathered only by holy people and with certain mystic rites.

"But the plant which is most commonly supposed to impart a knowledge of the language of animals is the fern. In a German story a cowherd lost cows, and as he trudged through the grass in search of them, his great shoes (such as people wore long ago) got filled with fern seed. Suddenly he heard the calf saying that a certain ale-house would sink into the ground. The dog asked, 'How long will it last?' and the cock answered, 'Till the end of the week.' But the cowherd shook the fern seed out of his shoes and heard no more. And in a week's time down sank the ale-house into a abyss. Similar stories are told by the South Slavonics and the Wends. In the South Slavonic version a cowherd lost two of his oxen on the Eve of St. John (Midsummer Eve), which is the only time when fern seed posseses this magic power. At last he espied his oxen lying on a bed of fern. Approaching them softly he was surprised to hear the older ox telling the younger ox that he (the elder ox) would be killed in the autumn, and that in the spring their master would be attacked by a snake, and could only be saved by the cowherd. All came to pass as the ox had foretold, but the cowherd never knew how just at that moment he had understood the ox language. The reason was that fern seed had fallen into his shoe without his noticing it; for if he had seen it, he certainly would not have understood what the oxen said. In the Wend story a man was herding horses, and the bloom of the fern, which blooms only at midnight, fell into his shoe. Next morning when he came home he told his friends what the geese had been talking about. This was noised abroad, and the squire sent for him. To

smarten himself up he took off his shoes and put on better ones, and from that moment he knew nothing of the goose language.

"Of the many other mystic properties of the fern, there is only one which it is desirable to mention in connexion with the language of animals. Fern seed or fern bloom is supposed to render the person who carries it invisible; but it is found only on Midsummer Eve, when it shines like burnished gold, but quickly fades and falls. not to be found again. The stories told of the invisibility conferred by fern seed resemble those told of its power of revealing the language of animals. A man was looking for a strayed foal on Midsummer Eve; and as he went through a meadow, fern seed fell into his shoes. In the morning he came home and sat down in the parlour. But it seemed strange that neither his wife nor anybody else paid any heed to him. Then he said. 'I did not find the foal after all.' Every one in the room shuddered visibly, for they heard the man's voice but did not see him. His wife shouted his name. He stood up in the middle of the room and said, "What are you shouting for? Here I am close beside you.' This only added to the general alarm. But now he felt something like sand in his shoes. Scarcely had he taken them off and shaken them, when he stood visible before the eyes of all."

"In reviewing the chief means of attaining the animal language, namely, rings, fern seed, and serpents, we may notice some points of contact between them. First, as to *rings*. We have seen (p. 112, note 5) that serpents confer wishing-rings upon their benefactors just as they confer the gift of tongues. Now it is a common idea that serpents have precious stones in their heads, and in the Annamite story we have seen that the gift of the

animal language is a special property of these stones. We may conjecture, therefore, first, that rings bestowed by serpents contain these serpent-gems; and second, that rings which confer the gift of animal speech are serpent-rings, that is, contain serpent gems. This conjecture is confirmed by a second parellelism which holds between magic rings and serpent-heads (or the gems in the serpents' heads); both alike are capable of rendering their possessor invisible. This was the property of the magic ring of Gyges, and it was equally a property of the gems found in the heads of the serpents near Paraka by the Indians, who also acquired the speech of animals by eating the heart and liver of these same serpents, and it is still supposed to be a property of serpents' heads in Bohemia. It is said to be a common opinion in Wales, Scotland, and Cornwall that about Midsummer Eve the snakes meet in companies and by joining heads and hissing produce a glass ring, which whoever finds shall prosper in all his undertakings; and these rings are called snake-stones. If this idea could be proved to be wide-spread, we might perhaps suppose that this ring is the wishing-ring bestowed by serpents on their benefactors: but in the absence of such proof it is better to suppose that these wishing-rings contain the gems from the serpents' heads. However, the time when these glass rings are formed (namely, Midsummer Eve) is remarkable, because, as we have seen, this is precisely the time when the animal language is supposed to be acquired through fern seed.

"The connexion of the *fern* with serpents in folk-lore is undoubted. In Germany the fern is sometimes called the adder-plant (Otterkraut), and anyone who carried it is thought to be pursued by adders till he throws it away. The Lithuanians also call the fern the serpent-plant, because the king of the serpents is supposed to

fetch the bloom of the fern on Midsummer Eve, to be his crown. In a Lithuanian legend a queen finds by night the serpents fighting with the other animals for the fern; she plucks the fern, wounds herself in the thigh with her sword, puts the fern into the wound, the wound closes on it, and immediately the queen becomes omniscient. This probably took place on Midsummer Eve, the time when the fern possesses its magic properties. Similarly in Russia the person who catches the golden bloom of the fern on Midsummer Eve should cut his hand with his knife and insert the fern into the wound; then all secret things become visible to him. Again, the same parallelism which exists between rings and serpents exists between fern seed and serpents; for fern seed, as we have seen (p. 109), like serpents' heads, renders the wearer invisible.

"The reason why the serpent is especially supposed to impart a knowledge of the language of birds appears from a folk-lore conception of the origin of serpents. According to Democritus as reported by Pliny, serpents are generated from the mixed blood of divers birds. This explains why serpents should understand the language of birds; they do so because they are blood relations of birds, having the blood of birds in their veins. If we ask why serpents are thought to be formed of the blood of birds, we may conjecture that the idea originated in the observation that serpents eat birds and birds' eggs. Hence on the folk-lore principle that in eating of an animals' flesh one absorbs the animal's mental qualities, (1) the serpent acquires the bird language, (2) anyone who eats a serpent also acquires the language of birds. From the language of birds to the language of animals in general is not perhaps a long step in folk-lore. The idea that birds are pre-eminently talkers appears in the practice, observed by some Turkish

tribes in Asia, of giving to children who are long of learning to speak the tongues of certain birds to eat.

"It is much less easy to say why fern seed is supposed to impart a knowledge of the language of animals. In a Thuringen story a hunter procures fern seed by shooting at the sun at noon on Midsummer Day; three drops of blood fall down, which he catches on a white cloth, and these drops of blood are the fern seed. If we could suppose that the blood thus falling from the sky was the blood of birds, all would be plain. But still this would not explain the special association of fern seed with Midsummer Day. From this association, coupled with the fact that the hunter shoots at the *sun* at noon on this day of all days in the year, it is difficult to avoid the conclusion that fern seed has a solar connexion. It would seem to be the blood of the sun rather than of birds. But if this is so, why should it convey a knowledge of the language of animals?"

A New Maidenhair from Peru[1]

WILLIAM R. MAXON AND C. V. MORTON

The new species of *Adiantum* described herewith is an inhabitant of the humid tropical forests of the montaña of eastern Peru. It is far more graceful than its near ally *A. peruvianum*, with which it has been confused.

Adiantum anceps Maxon & Morton, sp. nov.

Euadiantum, subsect. *Distichophyllae*. Rhizoma breviter repens, paleis spinuloso-denticulatis lucidis brunneis 3–4 mm. longis lineari-attenuatis dense instructum. Folia erecta, magna, stipitibus validis nigris lucidis laminas aequantibus; laminae majores 2–3-pinnatae, deltoideae, usque ad 60 cm. longae et 70 cm. latae, pinnis

[1] Published by permission of the Secretary of the Smithsonian Institution.

majoribus 3–5 subpatentibus; segmenta magna, alterna, longe petiolulata, inaequaliter ovata, basi rotundata vel late cuneata, lateribus curvata, apice sterili longe acuminata, glabra, pallide viridia, concoloria; sori oblongi, magni, numerosi; sporae pellucidae triplanatae.

Rhizome short-creeping, 5–10 mm. in diameter, densely paleaceous, the scales linear-attenuate, 3–4 mm. long, dark brown, lustrous, spinulose-denticulate. Fronds distichous, solitary, erect, up to 1.2 meters long, the stipes equaling or exceeding the blade, 2–5 mm. in diameter, nearly black, highly lustrous, subterete, glabrous; blades 1–3-pinnate, the smaller ones oblong-ovate to ovate, simply pinnate or (at base) bipinnate; large blades deltoid, up to 60 cm. long and 70 cm. broad, with 3–5 spreading main pinnae, the bipinnate basal pinnae up to 40 cm. long, with basal pinnules consisting of 3–6 very large segments; rachises similar to stipe; segments distant to adjacent, alternate, long-petiolulate (the stalks slender, 1–2.5 cm. long), articulate, mostly 5–8 cm. long and 2.5–5 cm. broad, asymmetrically ovate, the base (in all but the terminal ones) semicircular to rectangular or very broadly cuneate, the sides curved, the apex long-acuminate; sterile segments lightly incised-serrate toward apex; venation flabellate, the veinlets repeatedly forked, close, prominulous, free; leaf-tissue thin-pergamentaceous, light green, concolorous, glabrous; sori mostly oblong, 2–6 mm. long, borne singly or in pairs between shallow incisions, not extending to apex of segment, the reflexed marginal lobules (indusia) 2–2.5 mm. broad, dark brown at maturity, with a yellowish border, glabrous; sporangia very numerous, confined to the veins, the annulus 13–15-celled; spores yellowish, triplanate, about 35 μ in diameter.

Type in the U. S. National Herbarium, no. 1464528, collected in wooded valley near La Merced, Dept. Junín, eastern Peru, altitude about 700 meters, June 4, 1929, by E. P. Killip and A. C. Smith (no. 24069).

Other specimens to be referred here, all from the same general region in Peru, are as follows: The type locality, *Killip & Smith* 23478; Colonia Perene, Dept. Junín, alt. 680 meters, in dense forest, *Killip & Smith* 25077; Pongo

de Cainarachi, Río Cainarachi (a tributary of Río Huallaga), Dept. San Martín, alt. 230 meters, *Klug* 2688; Tarapoto, *Spruce* 4096. The Spruce specimen, which matches closely the type, is at Kew and is represented in the National Herbarium by a photograph and a single segment. The Klug material (3 sheets) is of much interest as including all stages from simply pinnate to tripinnate.

Apparently a rare species, allied to *A. peruvianum* Klotzsch, of Peru; but that, as represented in the National Herbarium by one of the two type numbers (*Ruiz* 27) and by other excellent material (*Cook & Gilbert* 1714, *Macbride* 4215, *Herrera* 1288, *Stevens* 125), is a plant of much higher elevations, differing in its trapeziform-oblong to exactly rectangular, more deeply lobed, glaucous segments, which in vigorous specimens are fertile to the extreme rectangular apex. Because of the ovate segments, simply pinnate specimens of *A. anceps* recall *A. platyphyllum* Swartz, a casual resemblance which has suggested the specific name employed.

WASHINGTON, D. C.

Recent Fern Literature

A considerable series of fern articles have accumulated on the editorial desk and they are briefly noted below.

CHING, R. C. The Studies of Chinese Ferns VIII. Sinensia **3**: 131–156, November, 1932.—This paper includes a discussion of *Woodsia* and *Cheilanthopsis*. It is noted that China seems to be the chief center for Woodsia, since it includes 20 species out of a total of 31 of world-wide distribution. Of the 20 described in this paper, *Woodsia alpina* and *W. ilvensis* of our own American flora are included.

CHING, R. C. The Studies of Chinese Ferns IX. Bull. Fan Memorial Institute of Biology **4**: 47–116,

February, 1933.—This paper includes a discussion of three tropical genera. One of these, *Lepisorus*, is described as a new genus with *Polypodium lineare* Thunberg as its type species. Dr. Ching is dealing here with one of the most complicated problems in the classification of ferns. The paper includes also a consideration of *Lemmaphyllum* and *Neocheiropteris*.

CHING, R. C. The Present Status of our Knowledge of Chinese Ferns. Peking Natural History Bull. 1932–33, Vol. 7, p. 253–273.—This is a general paper in which the author deals with the history of the studies of Chinese ferns, and the composition of the Chinese fern flora including a comparison of Chinese and eastern North American ferns, and also the northern European fern species. A considerable number of species are noted as common to eastern Asia and North America, and northern Europe respectively. It would be an interesting problem to make spore cultures of Chinese material identified with our native species and to grow such plants for comparison with our local forms.

TATEWAKI, M. The Phytogeography of the Middle Kuriles. Journ. Facul. Agr., Hokkaido Imp. Univ., Vol. 29, Pt. 5, 1933.—Professor Tatewaki's paper may be noted here because of its inclusion of a number of ferns and fern allies among which 17 of a total of 22 species are found also in North America.—R. C. BENEDICT.

It is not every day that one gets an opportunity to compare two papers on the same subject, with nearly identical titles, based to a considerable extent on the same material, prepared simultaneously, but quite independently and published within about a month of each other. Such is the case with two articles on "Ferns and Fern Allies of Missouri," one by Palmer and Styermark in this JOURNAL,[1] the other by Miss M. E. Pinker-

[1] 22: 105–122. Jan. 31, 1933.

ton in the Annals of the Missouri Botanic Garden.[2] Comparison of the two is, then, of rather unusual interest.

Miss Pinkerton has done a local manual with descriptions of each species, keys to families, genera and species and statements of habitat and distribution in Missouri and of general range. Palmer and Steyermark give a list without descriptions, but with an introduction dealing with the topographic and geological features of the state and with ample and careful notes on the ecological relations of each species. The difference in emphasis may be seen from the statements of habitat under *Asplenium Trichomanes:* "Sandstone rocks where plenty of water is available," Pinkerton; "Usually on granitic sandstone or chert cliffs and boulders, rarely on calcareous rocks," Palmer and Steyermark.

Neither paper attempts an up-to-date taxonomic arrangement. Probably for convenience and easy intelligibility, Palmer and Steyermark follow, in general, the order of Gray's Manual, which most pteridologists would now nearly reverse. Miss Pinkerton appears to follow a somewhat haphazard course. *Equisetaceae* are placed between *Polypodiaceae* and *Ophioglossaceae*, a position probably unprecedented in the literature of the fernworts. The genera of the *Polypodiaceae* are alphabetically arranged; the species (except, apparently by accident in *Asplenium*) are not.

Plainly because of inexperience and some carelessness, Miss Pinkerton becomes caught in a technical pitfall which might have been avoided by a more attentive following of previous literature and a better understanding of scientific usage in regard to names and of the classificatory relations of the plants themselves which underlie the names. For instance; she writes: "*Asplenium cryptolepis* (L.) Fernald . . . *Asplenium Ruta-muraria*

[2] 20: 45–78, map, 5 pl. Feb., 1933.

L.'' But Linnaeus had nothing whatever to do with the name *A. cryptolepis*, which first appeared 150 years after his death; and *A. Ruta-muraria* is not a synonym of it. The former is a name applied by Fernald to an American plant which had before been referred to the European *A. Ruta-muraria*, but which he regarded as distinct. The citation should have been: "**Asplenium cryptolepis** Fernald . . . *A. Ruta-muraria* of authors as to the American plant, not L.'' Since all this is given clearly enough by Fernald in the original publication of *A. cryptolepis*, there is little excuse for getting it confused. Similarly, *Asplenium Filix-femina* is not a synonym of *Athyrium angustum;* nor is *Polypodium vulgare* one of *P. virginianum*, nor *Osmunda Struthiopteris* of *Pteretis nodulosa*, nor *Pteris aquilina* of *Pteridium latiusculum;* and the proper author-citation for *Osmunda regalis*, var. *spectabilis* is (Willd.) Gray, not Fernald.

In content the two papers are naturally closely similar. Miss Pinkerton recognizes 69 species and varieties; Palmer and Steyermark, 68. The latter list *Salvinia natans*, found once in the wild in Missouri; Miss Pinkerton does not. Otherwise the differences are wholly due to somewhat different taxonomic points of view. Palmer and Steyermark, for example, recognize two varieties of *Athyrium angustum* which Miss Pinkerton, with considerable reason, regards as mere ecological variants. She takes up *Cystopteris bulbifera*, var. *horizontalis* Lawson for a broad-fronded form not segregated by Palmer and Steyermark and perhaps not properly associated with Lawson's Canadian plant.

The two papers supplement each other. Miss Pinkerton provides a means of identifying Missouri ferns; Palmer and Steyermark give much information about them, drawn from their ample field experience, in Mr. Pal-

mer's case extending over more than thirty years. Both papers should be in the hands of fern-lovers in Missouri.—C. A. W.

Alois Mussach has made a very thorough observational and experimental study of *Cystopteris fragilis* in the vicinity of Salzburg, Austria. He finds that it occurs only in hill country, generally at altitudes of from 400 to 1000 meters, 1530 m. being the extreme. It is never found in full sunlight; it requires shade and prefers north-facing slopes. Its pH figures run from 6.45 to 7.45. Acid, neutral and alkaline substrata were tested to see which gave the best germination of spores; this was found fastest and best on media showing a pH value of 6 to 6.8. Fresh spores and others one year and two years old were sown; the oldest germinated most quickly, but the fresh ones, sowed directly from the frond, gave a final better percentage of germination. Obviously, no period of rest, such as some authors have maintained is necessary for the best germination, is required in this case. Germination under like, controlled conditions is fastest in July, slowest in October. Good germination was obtained in pure water, but was best when 0.5 % of a culture medium was added. Larger proportions of the medium resulted in decreasing germination until at 3% it ceased altogether. Growth was naturally only slight in water and practically none in the higher concentrations of media at a time(60 days after sowing) when fully developed prothallia were to be found on the 0.5% solution. Germination was fastest at 35% below full sunlight, but in the end best at 25% The adult plant, however, does better at a higher light-intensity. No germination could be obtained in full darkness, though every possible means were employed to induce it. Light in nature is never constant; experiments were therefore made with light of different wave-lengths, ob-

tained by passing sunlight through differently colored sheets of glass. Germination was best under "neutral glass," with red second; development, however, was poor under red, best when ultra-violet rays were excluded and second under neutral glass. It appears, then, that type of light as well as intensity may be a developmental factor. Growth under blue glass, which otherwise is almost nil, can be stimulated by eosin. Other chemical tests were made; "humate" aided both germination and growth powerfully; growth was also fostered by salts of calcium and, in a less degree, of magnesium.[1]

Dr. Steil records briefly cases of asexual reproduction from prothallia in *Pteris flabellata*, *Pellaea cordata*, and *Cheilanthes Feei*. So far as he knows, no instance of apogamy has hitherto been reported in the genus *Cheilanthes*.[2]

In the course of a brief popular account of the ferns of Madagascar, M. François, Director of the Botanic Garden at Tananarive, makes the interesting observation that, though the phanerogamic flora of the island is rich in endemic species, the ferns have comparatively few. About 500 species have been recognized from the island; M. François thinks there are many others not yet described.[3]

Mr. Earl W. Hall lists 29 species of ferns from the region of Mountain Park and Roaring Gap, places which one may learn from the Postal Guide, but not from the author, are in North Carolina. One may suspect that the work on the list was not very critical, since it includes *Asplenium viride*, not known, so far as the present

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[1] Mussach, Alois. Untersuchungen über Cystopteris fragilis. Beih. Bot. Centralblatt **51**: 204–254, 36 figs. 1933.

[2] Steil, W. N. New Cases of Apogamy in certain homosporous leptosporangiate ferns. Am. Journ. Bot. **95**: 164–167, figs. 1933.

[3] François, E. La Flore de Madagascar; les Fougères. Rév. Hort. **105**: 500–503, figs 155, 156. 1933.

reviewer is aware, south of Vermont and northern New York.[4]

Dr. Maxon has published some miscellaneous notes on ferns, particularly valuable in that they give some of the results of his examination of type specimens and place definitely in synonymy certain doubtful species of Baker and Gilbert. A new genus, *Ormoloma*, based on *Saccoloma Imrayanum*, is proposed. In later notes a second, and new, species is added to *Ormoloma* (*O. Standleyi* from Costa Rica), and a new species of *Lycopodium*, *L. Skutchii* from Guatemala, is described.[5]

Shorter Notes

POLYSTICHUM ACROSTICHOIDES IN MEXICO.—Does this plant, our common Christmas fern, which ranges from Nova Scotia to Texas, extend southward into Mexico? The nominal basis for such a record is found in at least two specimens (in the Pringle and Gray herbaria) of *Pringle* 2604, bearing Mr. Pringle's characteristic label, "Plantae Mexicanae, 1889, State of Nuevo Leon," and labeled in his own hand as collected in the Sierra Madre, near Monterey, August 24. So far as the writer knows, this species is not otherwise reputed to grow in Mexico. The specimen is correctly determined; but since the nearest stations are far distant in eastern and northeastern Texas, it appeared at first that the locality data were decidedly open to question. And yet, considering Mr. Pringle's ability as a botanist and the extreme care with which he labeled his specimens, it was difficult to believe that extraneous material from the eastern United States would have been mixed in among his Mexican collection of a given year and hence been wrongly labeled

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[4] Hall, Earl W. A partial Check List of the Ferns found in the Mountain Park and Roaring Gap Region. Journ. Elisha Mitchell Soc. **46**: 69–71. 1930.

[5] Proc. Biol. Soc. Washington **46**: 139–146 and 157–160. 1933.

by himself; or that, as Mr. Weatherby pointed out in correspondence, even if this had happened, Davenport would have failed to note the possible error. Mr. Pringle's letters at the Gray Herbarium throw no light upon the matter; but Miss Helen H. Burns, of the University of Vermont, where Mr. Pringle's own herbarium is preserved, writes me that on page 643 of the third volume of the botanical portion (by Hemsley) of the Biologia Centrali-Americana she finds written in by Mr. Pringle the entry, "*Aspidium acrostichoides*, Mts., Monterey (*Pringle* 2604)." Under these circumstances it seems quite justifiable to regard the record as authentic. a conclusion in which Mr. Weatherby agrees.—WILLIAM R. MAXON.

THE AMERICAN WELSH POLYPODY IN NORTH CAROLINA.—Last summer, while teaching a course in field botany at Lake Junaluska in western North Carolina. a former student of mine, Mr. Don Correll, then nature councillor at Camp Sequoyah, sent me a peculiar-looking frond of a fern I had not seen before. After examining it for a while, I ventured the guess that it was possibly some form of *Polypodium*. I have wondered since how I came to this conclusion as, of course, the leaf was sterile. Apparently it was based upon a combination of characters, *viz.*, the size, the depth of the primary segmentation, and especially the venation and texture of the leaf. The only fern books available at the time were Tilton's *The Fern Lover's Companion* and Clute's *Our Ferns in Their Haunts*. In both of these books I found mention made of a bipinnatifid form of the Common Polypody known as the Welsh Polybody (*Polypodium vulgare* var. *cambricum*). I then recalled having seen somewhere in the AMERICAN FERN JOURNAL an article by Mr. F. W. Gray in which this form was illustrated.[1] After returning home, where I had access to

[1] AMER. FERN JOURN. 14: 1. 1924.

Polypodium virginianum f. cambricoides Gray in North Carolina.

the JOURNAL, I soon found the description and illustration of this form from West Virginia, and I quickly came to the conclusion that the fern I had was the American Welsh Polypody (*Polypodium virginianum* f. *cambricoides* Gray). A friend of Mr. Correll, Joe Crump from Macon, Georgia, took a kodak picture of this fern in its native habitat which is here reproduced. The fern was found on Bald Knob, Buncombe County.—H. L. BLOMQUIST, *Durham, N. C.*

NOTES ON FERNS FROM WESTERN NEW YORK.—During the course of several years of botanizing in western New York, it was my pleasure to find several of our more uncommon ferns in new stations and in one case, in a rather unusual situation.

Polypodium virginianum L. has been found in various places such as, Springville, Niagara Falls, Allegheny State Park, etc. Although it usually is found on rocks. Dr. Homer D. House, in his "Annotated List of Ferns and Flowering Plants of New York State," noted it rarely about the bases of old trees in swamps. Recently. I found a single specimen growing from a shallow depression in a tree about a foot from the ground. Its presence there was the more unusual because there was not another specimen within a ten mile radius. Its presence will always remain more or less of a mystery unless wind-borne spores can be held responsible.

As far as could be ascertained, *Athyrium angustum* (Willd.) Presl, var. *rubellum* (Gilbert) Butters. has never been recorded as such from this area although it has been undoubtedly seen rather frequently and passed off as the species. It was found in rather wet, shaded areas near Holland and also at Angola-on-the-Lake.

David F. Day in 1882 remarked that *Thelypteris cristata* (L.) Nieuwl. var. *Clintoniana* (D. C. Eaton) Weatherby, had been detected by Judge Clinton but not recorded locally. It is becoming better known now, how-

ever, and was recently pointed out to me by Neuman and Bleekman in a wood off Transit road near Orchard Park.

Crystopteris bulbifera (L.) Bernh. is not one of the most common ferns in western New York although it grows rather abundantly in suitable locations at Niagara Falls. This interesting fern was recently found less than twenty-five miles from Buffalo in a heavily shaded swamp near Alden, N. Y. It grew in rather close association with *Aralia racemosa, Benzoin aestivale,* and *Smilacina racemosa.*—IRVING WILLIAM KNOBLOCH, *Buffalo, New York.*

FERNS IN BOTTLES.—Our attention has been called to an article which may be of interest to some of our members. The article in question "Ferns grown under Bottles," by Charles E. Benham, was published in the English *Journal of Botany* in 1924. It relates that in the town of Colchester, England, a certain Italian restaurant-keeper conceived the idea of using empty Chianti bottles (which are usually of a bulbous shape) as edging for the flower-beds in his garden. He planted some hundreds of them upside down, with their necks thrust into the ground. To his surprise he found, as time went on, ferns springing up in almost every one of the bottles. Some years later, when the article was written, the ferns (which were of "great variety") were almost without exception alive and vigorous—indeed, had developed so profusely that their fronds were literally packed into the small space within the bottles available for their growth. Yet Mr. Benham could not discover that the garden had ever before been used for fern culture.

His explanation is that fern spores are omnipresent in the soil, but lack appropriate conditions for development except when given the protection and the comparatively warm and moist environment provided by the miniature glass-house of the bottle. He tried setting an inverted

bottle in his own garden and duly got a spleenwort under it, though it took about a year.

It should be interesting to try the bottle experiment in this country and see if like results could be obtained in our climate.—C. A. W.

A NEW VARIETY?—Two or three seasons ago on a field trip I picked up supposedly a specimen of *Athyrium Filix-femina*, var. *rubellum* to fill a vacant spot in my rockery. Last Spring, much to my surprise, the fern threw up a spore stalk similar to *Osmuda cinnamomea* and was identified by Mr. C. A. Weatherby as a true cinnamon. A closer inspection showed that this fern was true to type of the cinnamon with the exception that the rachis was a deep reddish-brown. It grew about two feet high this past season but probably will reach a much greater height as it grows older. Neither Mr. Weatherby or Professor Clute had at the time any record of such a variation and I have been unable to find anything referring to it in any fern literature. Recently, however, the report from Mr. Dix which follows this note has come in. Although I have made no thorough search for further specimens I have since run across two similar specimens the past season. I am wondering if any other members of the Fern Society have found this "sport," and if so I would like to hear from them either by letters or through the columns of the JOURNAL. Next Spring I shall try to raise others from this fern from spores. I would like to hear from those who care to exchange living specimens.—M. R. SHARPE, Uxbridge, Mass.

The note in a recent issue of the FERN JOURNAL on the coloration of the young fronds of the Royal Fern reminds me that *Osmunda cinnamomea* has a form that has reddish stalks and fronds, especially when young. I have had one in my garden for three years; this has never fruited. Recently I visited a field of about three hundred Cinnamon Ferns and there found five of the reddish variety. One of these had spore-stalks.

The color of this form is different from that of the young Royal Fern, a dark reddish brown, similar to the young fronds of the Chain Ferns. The color gradually fades from the pinnae as it develops, leaving the stalk only slightly colored, as in the red-stemmed Lady Fern.—W. L. DIX, Trenton, N. J.

American Fern Society

As a result of the interest aroused by Mrs. Boydston's exhibit of ferns at the Chicago exposition, the authorities of the Department of Botany at the University of Chicago are meditating a permanent living collection of all ferns native in the United States, the tropical species to be grown in a greenhouse, the hardy ones in a tract of woodland at Lake Geneva recently given to the University. Mrs. Boydston (whose address is 559 Clinton Place, River Forest, Illinois) invites comment from readers of the JOURNAL as to their interest in such an enterprise, their experience with unusual or difficult species and what species they would be willing to contribute, carriage charges to be paid by the University.

MEETING OF THE AMERICAN FERN SOCIETY AT THE BROOKLYN BOTANIC GARDEN

The Brooklyn Botanic Garden, through the Director, Dr. C. Stuart Gager, has extended a very cordial invitation to the American Fern Society to hold a meeting and program at the Brooklyn Botanic Garden. Through Dr. E. T. Wherry, President of the Fern Society, this invitation has been accepted, and a Committee of Arrangements has been appointed, with Dr. Henry K. Svenson as Chairman. The following program has been arranged for Saturday, April 14, 1934:

I. INSPECTION OF FERNS AND FERN LITERATURE AT THE BROOKLYN BOTANIC GARDEN: 10:30 A. M.

(a) Welcome by Dr. Gager, for the Brooklyn Botanic Garden.

(b) Fern literature in the Library of the Brooklyn Botanic Garden, and in the Library of the American Fern Society. Dr. A. H. Graves.

The history of ferns as recorded in publications over a long period of years has an interest and value that cannot be overestimated. The Brooklyn Garden Library includes a wide range of fern titles, as has been indicated in the list of books available for loan to members. Some outstanding new books have appeared since that list was published. The Fern Society Library includes, besides a good collection of interesting fern books, a considerable series of reprints of articles by members of the Fern Society.

(c) The Fern Herbarium of the Brooklyn Botanic Garden. Dr. H. K. Svenson.

Here may be seen actual specimens of American fern species together with a considerable collection of species from all over the world. Visitors can get advance and accurate ideas of fern species they have not yet been able to find themselves, as well as verification of identifications of forms already collected. Members are invited to bring in specimens for identification.

(d) The Greenhouse Collections of Ferns.

There is a considerable general collection, representing a wide variety of fern genera, together with a special collection of the variations of the Boston Fern and of other species of the genus, Nephrolepis. These were brought together for special study by R. C. Benedict who will act as guide to any who are interested. If any visitors are interested in growing ferns from spores, it will be possible for them to obtain fresh spores from a variety of species.

II. TEA AND SANDWICHES: 12:30 P. M. ROOM 322.
MISS HESTER RUSK.

III. FERN GROWING AND FERN COLLECTING. 2:30 P. M.
ROOM 320.

(a) Growing Ferns in the House. Mr. Montague Free, Horticulturist.

A practical discussion dealing with the selection of the best varieties for house use, with potting and soils, and with the treatment of fern pests.

(b) Wardian Cases for Ferns. Miss Ellen Eddy Shaw, Curator of Elementary Instruction.

Demonstrations of different sizes and types of glass cases for growing plants indoors which will not flourish under ordinary house conditions.

(c) Experimental Fern Culture. Dr. Elva Lawton, Hunter College, and Resident Investigator, Brooklyn Botanic Garden.

Miss Lawton has carried on some fascinating culture work with a number of fern species. This work is being continued at the Brooklyn Botanic Garden.

(d) Fern Collecting in the Galapagos Islands. Dr. Henry K. Svenson, Associate Curator of the Herbarium.

Dr. Svenson has had the kind of opportunity which all of us envy. He will show specimens and pictures of his collecting trip.

IV. DINNER AU NIPPON AND EVENING PROGRAM. 6:30 P. M. at the Miyako Restaurant, 340 W. 58th St., New York City.

The cuisine unfortunately does not include any form of fern material, but attendants may be assured that the variety will be sufficiently diverse notwithstanding, and the general standing of this restaurant is high. It is expected that the dinner will cost about $1.25. Just to whet the appetite, a few of the dishes available may be announced: Miso shiro, or suimono; tempura; umani; sunomono; suki yaki, or tori nabe; chawan mushi, etc. Chopsticks are au fait, but silver may be obtained by special arrangement.

Professor Ralph Cheney, Chairman of the Department of Biology at Long Island University, and Resident Investigator at Brooklyn Botanic Garden, has been asked to preside, with special instructions to see that no speaker exceeds the time limits set for him.

Program: Rare species of Asplenium of the United States, Dr. Edgar T. Wherry, President of the American Fern Society.

Ferns of the New York Region: Mr. James L. Edwards, of Montclair, New Jersey.

The officers of the Fern Society hope that this program may appeal to a large number of Fern Society members; and that the meetings may have a full attendance from those in the vicinity of New York City. Members are most welcome to bring with them any friends who may be interested in the program. Only one qualification is made to this generally wide-open invitation; namely, that those who are coming to the tea at the Brooklyn Botanic Garden, and/or to the dinner and evening meeting are asked to let the Committee know ahead of time so that appropriate plans may be made. Such notification should be made preferably immediately on receipt of this notice, by card, or by telephone to Dr. Svenson at the Brooklyn Botanic Garden. No advance notice will be necessary for attendance at the morning or afternoon meetings at the Garden.

The officers hope that this meeting may be the forerunner of similar meetings in different centers. Indeed, it may be noted that a summer field meeting is already being talked about for eastern Pennsylvania. The pages of the AMERICAN FERN JOURNAL are open for announcements of prospective meetings. It is only necessary to make plans far enough ahead so that the infrequent quarterly appearance of the JOURNAL may be adequate notification.

New members:

Hyde, Mrs. Clarence R., 242 Henry St., Brooklyn, N. Y.
Rusk, Miss Hester M., Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N. Y.
St. John, Edward P., Floral City, Citrus Co., Florida
St. John, Robert P., Floral City, Citrus Co., Florida
Shaver, Prof. Jesse M., Peabody College, Nashville, Tennessee
Stephenson, Leonard T., Buchtel, Ohio

Changes of address:

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Published by the

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EDITORS

R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

Vol. 24 APRIL–JUNE, 1934 No. 2

A Visit to the Southern Appalachians

E. W. Graves

During September of 1933 business interests took me through northern Alabama, northern Georgia, and western North Carolina. I endeavored, while so near to a region where some of the rarer Aspleniums grew, to spend a little time with the ferns.

The first opportunity came when I reached Monteagle, Tennessee. At this place, which is on Cumberland Mt., I spent an hour exploring a wooded ravine, but found nothing of interest except *Dryopteris noveboracensis* and *Dennstaedtia punctilobula*. Driving on, following the highway toward South Pittsburg, I stopped at a large spring ten miles from the city where water flowed out of a limestone cliff. At this place I found *Pellaea atropurpurea* and *Cheilanthes alabamensis*. When I reached South Pittsburg I did not feel that I had time to visit the station of *Scolopendrium vulgare*, so I crossed the Tennessee River, going through Long Island, Alabama, and ascended Sand Mt., going directly to the place where I had found *Asplenium trudelli* several years before. I felt sure I would find the hybrid still growing there, as I had seen a large plant with several small ones growing near on my former visit in 1929. I examined the cliff from above, then going below I searched it carefully from the bottom, but I could not find a single plant. I found plenty of *A. pinnatifidum*, and several plants of *A. montanum*, but not one plant of the hybrid. Per-

haps a drouth had destroyed the few plants that grew there.

I next drove to another location near Eliza, Alabama, where I had in years past found *A. pinnatifidum* growing on sandstone outcrops, and near by on other outcroping ledges I had found *A. montanum*. This time I found both ferns growing as I had found them 16 or 18 years ago. *A. pinnatifidum* grew on several ledges, but *A. montanum* did not grow on the same ledges with *A. pinnatifidum*. Only a few rods away was a somewhat higher ledge of sandstone, and here *A. montanum* grew, but no *A. pinnatifidum* was there, nor had I ever found it there. Each had been growing alone for 18 years only a few rods apart, and neither had spread to the habitat of the other.

My next stop was at the cliffs near Trenton, Georgia, where I had formerly found *A. gravesii*. I hoped to again find some plants of this hybrid. As I searched the cliffs I found plenty of *A. pinnatifidum*, and a number of plants of *A. bradleyi*, but apparently the hybrid was not to be found. As I crept along the cliffs finding nice plants of *A. pinnatifidum* I would pull them out of the crevice and put them in my coat pocket. After I had gathered sufficient specimens to satisfy me, I returned to the car where I had left by wife and mother, to look after things while I collected ferns. I prepared to put the ferns in the press, and, to my great joy and surprise I found I had collected a nice specimen of the hybrid, unknowingly, in a bunch of *A. pinnatifidum*. It was a good specimen with several fair-sized fronds showing the brown stipe extending to the first pair of pinnae. Had I time I believe I could have found more plants of the hybrid, but I could not take more time here. I also found a number of plants of *Cheilanthes tomentosa* at this place.

Among the different specimens of *A. pinnatifidum* I found at the three stations on Sand Mt., I was impressed with the different characteristics in frond cutting. At the Long Island station I found two or three plants with fronds that were almost pinnate below. The incisions were so deep that there was almost formed a pair of pinnae of the first pair of lobes, and they were long, narrow and tapering to a point that extended one third out beyond the other lobes of the frond. If it had had several pair of pinnae shaped like the one lower pair, I would have taken it for *A. trudelli*, but it had only the first pair of lobes that were shaped much like pinnae of *A. trudelli.* I found several plants like this at the Long Island station. Those at the Trenton station were bluntly triangular-lobed similar to those I have seen from many other stations. I have specimens from other stations throughout the eastern United States, among them some sent me by Mrs. Tanger, of Lancaster, Pa., and Mr. Benedict, who collected them at Hawks Nest, West Virginia, and Hamilton, Alabama, and they all adhere closely to the Trenton type of frond cutting.

My next stop was at Dahlonega, Georgia, which is located in the north-central part of the state, lying on the south rim of the Blue Ridge Mts., at an elevation of about 2,000 ft. Here I found *Botrychium obliquum tenuifolium*. Driving through the north-east part of the state, I made a short stop at Tallulah Falls, where *Trichomanes petersii* has been recorded. I did not attempt to rediscover it, as the country below the falls was very rough, where the Savannah River cuts a deep gash in the sandstone escarpment.

In passing through North Carolina I did very little collecting. Along the highway I saw great patches of *Dennstaedtia punctilobula*, as this seemed to be the most plentiful fern in the mountains of western North Carolina and eastern Tennessee.

At Crab Orchard, Tennessee, which is in the Cumberland Mts., I found the largest plants of *Pellaea atropurpurea* I have ever seen. These plants, which seemed to be so thrifty in growth, were found on limestone cliffs and abutments of a railroad bridge. Some of them were more than 18 inches high. Along the highway just before reaching Monterey, Tennessee, I found a large number of *Asplenium montanum* growing on sandstone cliffs shaded by trees.

I soon left the mountain region, and this brought my fern collecting to an end.

BENTONSPORT, IOWA.

Kansas Species of Equisetum*

JOHN H. SCHAFFNER

Kansas, the central state of the Union, is the most typical prairie state. Consequently there are few Pteridophytes within its borders. Four species of Equisetum have been collected in the state and this probably represents the entire Equisetum list. Professor Frank C. Gates, of the Kansas State Agricultural College of Manhattan, asked me to make a study of all the material in the College Herbarium, and the results of this study together with the record of all the Kansas specimens in my own private herbarium are given below.

Equisetum kansanum Schaffn., being the most characteristic prairie species, is the most abundantly represented. It is commonly found along ravines, on clay banks, and on ordinary levels where the soil is of such a nature as to retain moisture at certain seasons and where it does not meet too much competition with the typical prairie grasses. One can say, however, that it actually

---

* Papers from the Department of Botany, the Ohio State University. No. 335.

grows in the prairie. In the short grass plains of the western third of the state, it may be found along moist creek banks and on suitable banks or bluffs of ravines, creeks and rivers, especially on those facing toward the north. Cattle are rather fond of the plant and it is thus usually browsed off in pastures. *E. laevigatum* A. Br. is the second most common species and is characteristically found in suitable habitats in the broad first and second river bottoms which are a prominent feature of the state and which are usually covered with Big Bluestem prairie. It is sometimes found growing intermingled with a normal grass stand. *E. praealtum* Raf. is found occasionally in the eastern half of the state along river and creek banks, usually not far from the water. *E. arvense* L. is confined to the north-eastern one-fourth of the state and can be found on river banks or on rather young bluffs arising from the first bottom or flood plain and in its western limit especially around perennial springs where the soil or rock is continuously moist.

In making this study it was a great pleasure to meet with familiar names of botanists who helped make the collections. Some of these who have passed to the great beyond were personal friends of the writer and assisted him in his early studies of the flora of Kansas. Among those who contributed to the two Equisetum herbaria may be mentioned: W. A. Kellerman, Elam Bartholomew, A. S. Hitchcock, J. B. S. Norton, Kenneth K. Mackenzie, Geo. L. Clothier, B. B. Smyth, H. N. Whitford, Frank C. Gates, John H. Schaffner, S. V. Fraser, W. H. Camp, John Hancin, Clement Weber, Margaret A. Schaffner, Margaret Newcomb, and many others.

In the list, the letters K and S, after the county names, stand respectively for specimens in the Kansas State Agricultural College Herbarium and the Schaffner Equisetum Herbarium. In some cases a county is represented by a considerable number of specimens.

1. *Equisetum laevigatum* A. Br. Smooth Scouring-rush. Pottawatomie S, Riley K, Clay S, Cloud K, S, Saline K, Graham S, Sheridan K, Cheyenne S, Meade S, Barber K.

2. *Equisetum praealtum* Raf. Great Scouring-rush. Doniphan K, Pottawatomie K, Riley K, S, Clay K, S, Republic K, Shawnee K, Osage S, Lyon S, Sumner K.

3. *Equisetum kansanum* Schaffn. Kansas Scouring-rush. Jefferson S, Shawnee K, S, Wabaunsee K, Pottawatomie S, Clay K, S, Mitchell K, Saline K, Ellsworth S, Chautauqua K, Kingman S, Reno K, Edwards K, Ellis K, Rooks K, Sheridan K, Decatur K, Cheyenne S, Wallace S, Gove S, Ness S, Finney S, Gray S, Meade K, S, Seward K.

4. *Equisetum arvense* L. Field Horsetail. Doniphan K, Brown K, Wyandott K, Leavenworth K, Douglas S, Shawnee K, Wabaunsee K, Riley K, Clay S, Cloud K, Saline K.

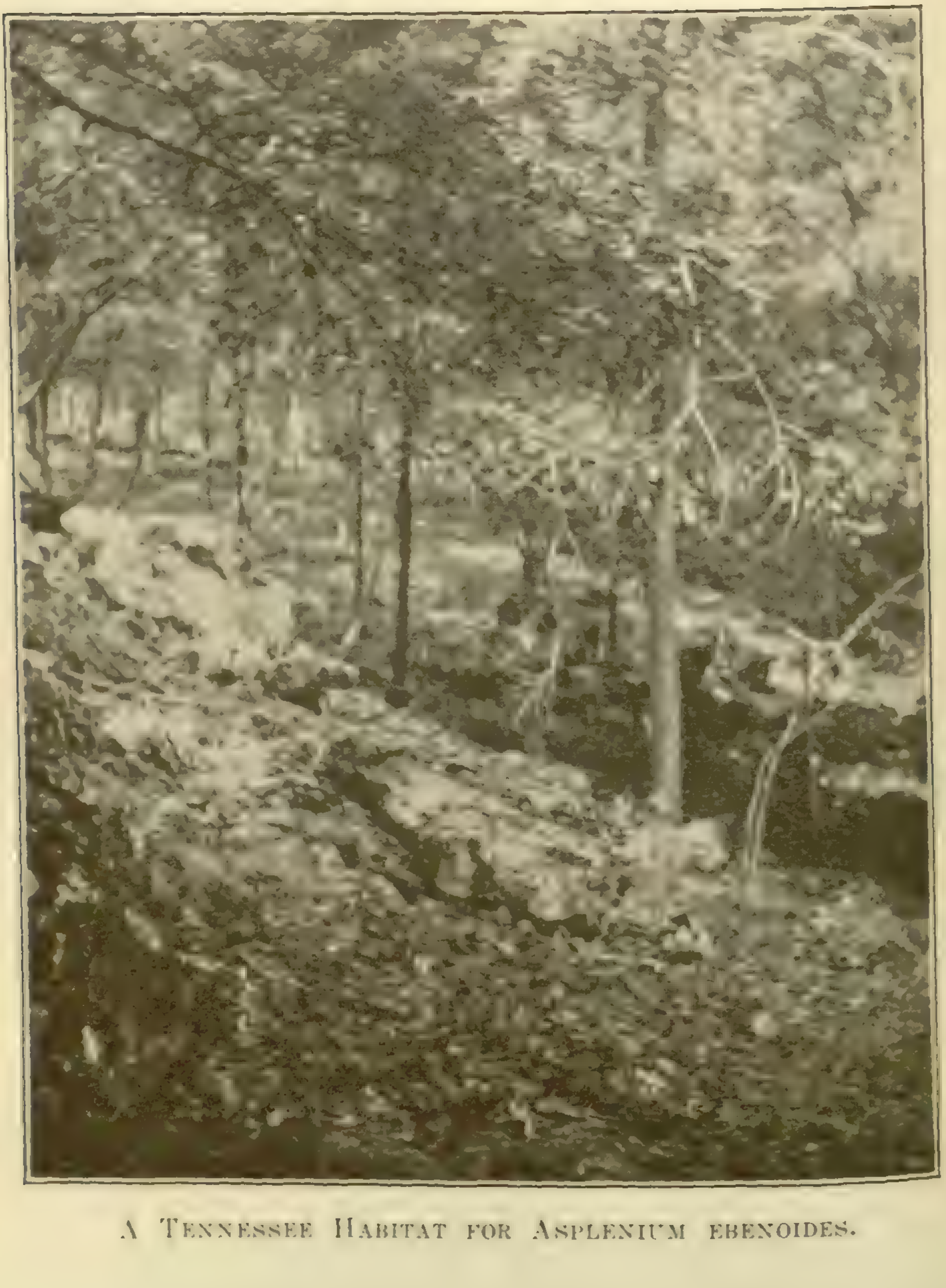
COLUMBUS, OHIO.

Scott's Spleenwort in Tennessee

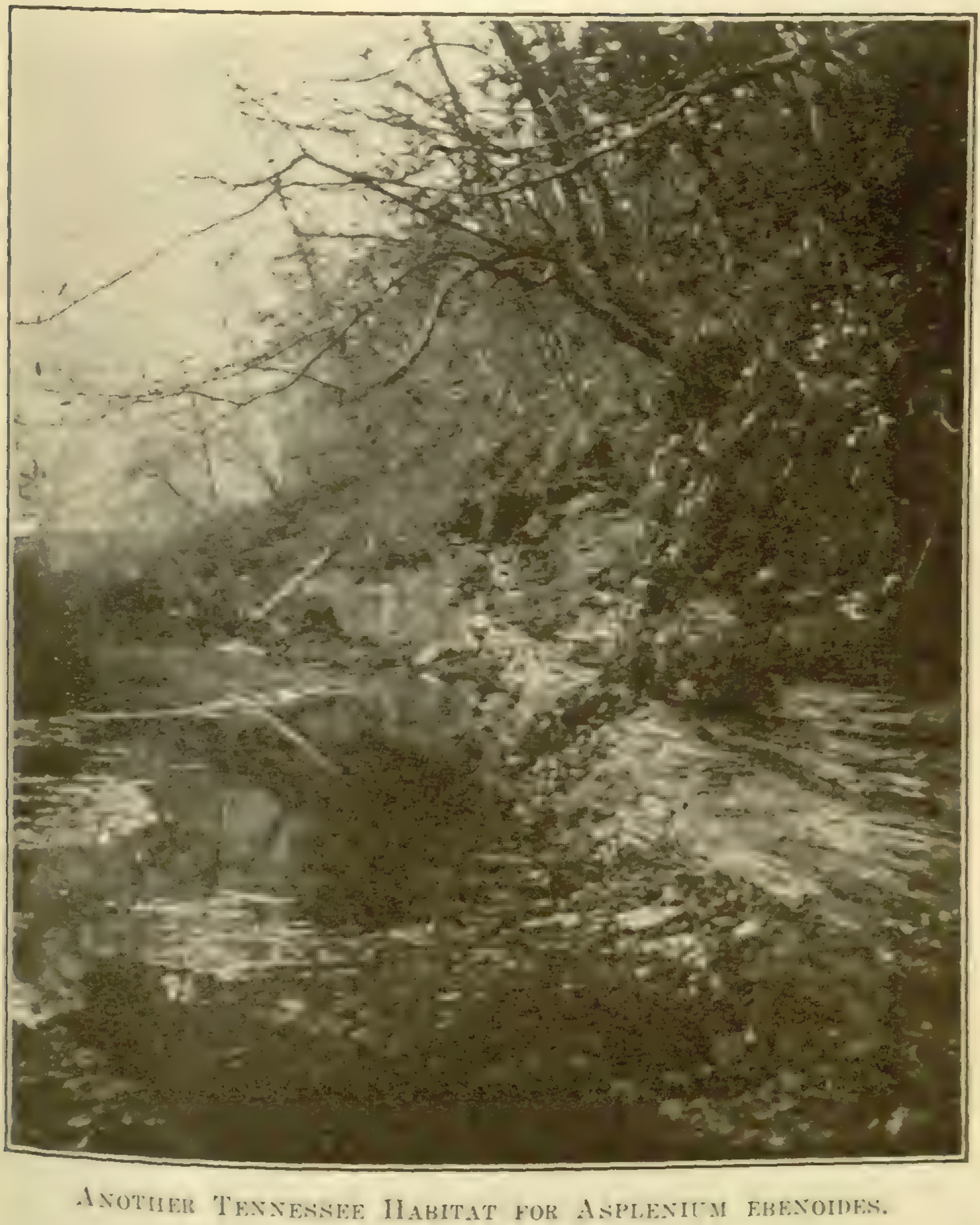
JESSE M. SHAVER

Until this summer, only one station for Scott's Spleenwort (× *Asplenium ebenoides* R. R. Scott) was known in Tennessee. This single station at Beersheba Springs was discovered by E. W. Graves on an automobile trip in 1929 through Tennessee to Sand Mountain, Alabama, and reported in the AMERICAN FERN JOURNAL, volume 20 (No. 1), pp. 22–25. Anderson (1930–1931) failed to find this fern in Tennessee as did also the earlier botanist, Gattinger (1901). This unusual rarity has seemed hard to understand in view of the abundance of *Camptosorus rhizophyllus* (L.) Link and *Asplenium platyneuron* (L.) Oakes, especially in Middle Tennessee, where both are frequently found growing together.

In the spring of 1933, the author resolved to pay especial attention to all masses of *Camptosorus rhizophyllus* found on his Sunday field trips. However it was not until October 8, 1933, that the first station for the hybrid was discovered. This station is about thirteen miles south of Nashville, near U. S. Highway 70 and directly west from the Mt. View School (Davidson County) in a mixed hardwood forest close to the edge of a cedar forest in an old field. This is an open forest with almost no undergrowth but with many cedar (*Juniperus virginiana* L.) stumps, the cedars having been removed for timber (Plate 2). Apparently this station is located on soil overlying Lebanon limestone and characterized by numerous sink-holes. As a matter of fact, this *A. ebenoides* station was located on a slightly sloping hillside (eastern exposure) about halfway between two sink-holes which were about one hundred yards apart. Only two *A. ebenoides* plants could be found in spite of careful search. A few fronds were collected and sent to Dr. Wil-



A Tennessee Habitat for Asplenium ebenoides.



Another Tennessee Habitat for Asplenium ebenoides.

liam R. Maxon, who confirmed the author's identification. This station is in a very precarious condition due to the grazing of cattle and horses and the rooting of the hogs in this field. The author piled stones partly around these plants in an effort to protect them.

The second station for ×*Asplenium ebenoides* in Davidson County (Tennessee) was discovered October 15, 1933, about fifteen miles northwest of Nashville on a steep north-facing hillside above a small bluff over the Little Marrowbone Creek almost directly across the creek from Mr. E. J. Ankenbaur's home. This is down the stream from Setter's Lake. The bluff here is covered with a young mixed hardwood forest approaching the climax Beech-Maple forest of such hillsides. There was an excellent accumulation of humus present. Two plants only were found. This area is not now grazed. The bluff and the steepness of the hillside will in the future protect it from all grazing except that by sheep and goats. In view of the small number of plants at each of these stations and the few stations for this fern in Tennessee, it is hoped that fern students will not collect here.

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GEORGE PEABODY COLLEGE FOR TEACHERS,
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The Second Year

FREDERICK L. FAGLEY

One year ago I was moved to note a few of the experiences of a rank novice in learning to know some of the ferns. The brief sketch published in the JOURNAL brought me several most interesting letters which were ample compensation for the unabashed revelation of ignorance and added much to my interest in the ferns and several welcome exchanges.

One of my new correspondents, Mr. F. Willard Bowman, of Douglaston, L. I., visited us at Sunapee, camping with his interesting and patient family near our cottage, while Mr. Bowman and I trailed around Lake Sunapee and in the foot-hills of Mt. Ascutney, Vt., all rich fern country. I know one narrow cut near Ascutneyville, Vt., where I take fern lovers, for here may be found a dozen or more varieties in superb growth—some of these not found in near-by territory.

Mr. Bowman sent me some plants, among them a *Woodwardia virginica*, for which I made an artificial swamp in my fernery where it grew very satisfactorily. Another friend, Professor W. L. Dix, of Trenton, N. J., sent me some beautiful plants of *Lygodium palmatum* which grew during the summer. I can only hope they outlive the northern winter of Lake Sunapee, but "I ha' me doubts."

Among the many interesting experiences of the summer there were two episodes which I will always remember. The first came about in this way. I have three strong plants of *Dryopteris filix-mas* in my fernery (and I did not steal them either!), but I wanted desperately to find it growing naturally. Mr. J. G. Underwood, former Treasurer of the Society, had promised to take me to the original station which is near his home at Hart-

land, Vt., but a convenient time has not yet been found. But in reading some back numbers of the JOURNAL I ran across an article by Mr. Winslow in the July–September issue of 1917 in which he tells of finding the Male Fern on Paine Mt., Vt. He wrote, "a clearing extends from this point (south end of ridge) down the western slope . . . among the rocks and thickets the Male Fern is abundant and continues down the slope in a general northwesterly direction."

Now this seemed plain directions and we, my friend Dr. Charles Burger, of St. Louis, and myself, set forth for Paine Mt., which is about 100 miles from Sunapee. We got an early start, 5 A. M., and reached the village of Norwich, Vt., in good time. But who knew where Paine Mt. was? We took the magazine to everyone who seemed "likely," but no one knew, or, if they did, thought we might be government inspectors of some sort, and Vermont taciturnity was everywhere evidenced. Finally the Postmaster thawed and told us that he rather remembered Mr. Winslow on his visits to Norwich and of course he had known Professor Shaw, with whom Mr. Winslow had "mountaineered." But Professor Shaw was dead, his family not at home, but if we would drive up the mountain road a mile or so, we would find a gate where the car could be parked and we should then follow the trail up to the abandoned State quarry. No doubt this was the place. So away we went. We found the gate after some two or three false trails had been followed their tortuous lengths. Yes, here was the quarry and above us a mile or two away, was the crest of the mountain, but it had no "south end" as it lay east and west—but it had a top—so up we went.

Ferns of many kinds abounded, but none of those we sought. After a long and weary climb up, over, around and down the mountain we went back to the village for

lunch. While there we found another Vermonter who would talk and after reading the article he told us we had been up the wrong peak. Paine Mt. has three peaks and we had gone up the South Peak, while the article evidently referred to the middle peak. So away we went again and climbed up this peak hoping to find a South end where we might take up our directions, but no South end was findable. In late afternoon, however, we did find a slope with thickets, rocks and bushes that seemed to fit the specifications, but not a fern of any description. So home we went, a long 100 miles back. A letter from Mr. Winslow later told me that the fern bed had been turned into a pasture and I judge we found the place but we did not find the fern.

The second episode was also a following of a clew. On page 11 of "How to Know the Ferns" is this sentence—"Miss Margaret Slosson has broken the record by finding thirty-nine species and eight varieties near Pittsford, Vt., within a triangle. . . ." Well we, my wife and I, wanted to go to Pittsford and find that triangle and some of the varieties. A friend at Pittsford, the Rev. C. C. Claris, kindly helped us. Miss Margaret Slosson was not at home, but her sister Miss Alice was and to her we owe many thanks. It so happened that she was engaged for the Saturday but Mr. Claris knew a fern picker and to him we went though it was late at night. The fern gatherer, a Mr. Hendy, descendant of the original patentee of the township, knew every mountain and valley within 20 miles, but not the desired triangle. But this he offered to do; if I would be at his home at 5 A. M. the next morning he would take me to a fern bed the like of which he knew I had never seen. So at 5 A. M., without even a cup of coffee, away we went for twelve miles of a winding mountain road, then two miles through bushes, weeds and undergrowth, all wringing wet, over

an unbroken trail to the crest of the mountain and down into a glade just over the top. Here we found a vast expanse of ferns growing in greatest luxuriance. The ferns he wished me to see were magnificent plants of *Polystichum Braunii*. We found plants with thirty and more fronds, some of which were more than 28 inches long. I did not spoil his pleasure by telling him I had several plants of this beautiful fern in my fernery, but I had no idea this fern ever grew to such size and beauty. To see them clustered among other ferns, all growing to perfection in the narrow valley, with the rocky sides covered with polypody, was surely worth the trip. The way back was through other fern beds and I learned much of the way of market picking. Mr. Hendy had just closed a contract for one half million "dagger" ferns—the unfertile fronds of the Christmas fern. His daily income is about $2.10 and I asked him if he would give me the day and he said he would gladly as he had not expected to work this day. Then I asked him why the 5 A. M. start and this is the reply I got—"Well, you see, I did not know you, or whether it was worth my time to take you up the mountain, so I said I'd go if you would start at 5 A. M. I knew if you were one of these soft city fellows, not worth my time, you would balk at the early going. I did not know whether you would come or not, so I stayed in bed until your horn sounded, then as it was five minutes to five, I said, Well, he's worth it—" Not so bad a test. I recalled to him the test Jesus set for the blind man to bathe in Siloam, and we were off into a discussion of theology which as the day wore on, alternating with fern lore and early history, gave us as interesting a day as one could wish. During the day we visited fern beds, walking ferns, banks of Maidenhair-Spleenwort, Crested Woodferns of enormous size, Clinton Woodferns, etc., etc., but no Goldie nor Male fern.

In the evening Mr. Claris took us to visit the fernery of Mrs. Chisholm at Proctor, which is worth going miles to see. Mrs. Chisholm showed us a very rare *Dryopteris*, perhaps the only plant of its kind known. It is about the size and style of *Polypodium vulgare*, but the fronds grow from a crown in true Dryopteris style. The plant in other ways represents the Dryopteris family. Mrs. Chisholm gave us fronds of other rare and beautiful ferns, thus adding some unique features to our herbarium.

When we returned to our hotel Miss Alice Slosson was waiting to learn of our day. I was to be engaged the Sunday morning so could not continue ferning, but she said that she would worship out of doors and if she found anything she thought we should like, she would leave it for us. On our return from church there was a large basket with great clumps of *Pellaea atropurpurea*, *Asplenium ebeneum*, *A. Trichomanes* and *Camptosorus rhizophyllus*, all well packed for the journey back to Sunapee, where snugly planted on a limestone base they were growing nicely when we left in October.

There have been many other interesting features of the year but space must not be too selfishly used. I want to pay a word of tribute, however, to the long suffering patience of Mr. C. A. Weatherby, of the Gray Herbarium, Cambridge, who has helped me greatly to know the ferns found on these trips and elsewhere, even when the same fern is sent him two and three times. But how is an amateur to know that a young woods fern may not be one of the woodsias? until he is told that with ferns as other young, "all babies look alike"? Having been a father three times I aver that this may be true of young ferns, but of babies "'tain't so."

Well, now I want to know where . . . the Massachu-

setts fern is found. The Goldie, the Male Fern and the Lip ferns—to find these is the program for the third year.

WHITE PLAINS, N. Y.

Recent Fern Literature

To the gratification of all serious students of the subject, Mr. A. H. G. Alston, of the British Museum, has, in recent years, interested himself in the classification of pteridophytes. His latest publication gives the results of an investigation of fourteen species published by Sir James Edward Smith in Rees's Encyclopedia from 1808 to 1818, as the genera concerned came along in the alphabetical arrangement of the work. These species are listed as doubtful in Christensen's Index or, in the majority of cases, do not appear there at all. Yet the type specimens exist in Smith's herbarium; Mr. Alston has performed a useful service to taxonomy in looking them up and determining them. The result, as usually happens in such cases, is the upsetting of a few familiar names—*Microlepia hirta*, for instance, must now become *M. setosa* (Sm.) Alston. To North American pteridologists perhaps the most interesting of Mr. Alston's discoveries is that Smith, long before Brackenridge, named the chain-fern of the Pacific coast which now passes as *Woodwardia Chamissoi*. It must become *W. fimbriata* Sm.[1]

Mr. Arturo Burkart has recorded no less than six exotic species of ferns which have established themselves more or less thoroughly as weeds in and about Buenos Aires—*Cyrtomium falcatum* (L. f.) Presl, var. *acutidens* (Christ) Nakai, which propagates by spores; *Nephralepis*

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[1] Alston, A. H. G. Certain ferns in Sir James Smith's herbarium. Philippine Journ. Sci. 50: 175–184, 1 pl. 1933.

cordifolia (L.) Presl, much cultivated, especially as a cover for palm-trunks in gardens and sometimes establishing itself on the trunks and branches of other trees; and four species of *Pteris*. *P. longifolia* has made itself very much at home on walls, especially retaining-walls along railroads. *P. multifida* is also well established in similar situations; *P. cretica* and *P. tremula* much rarer.

The article also contains interesting notes on five native species.[2]

Bracken is usually regarded as an indicator of acid soils. In a few cases, however, European botanists have found it growing in soil containing as high as 50 per cent of lime. M. de Litardière now reports a station near Grenoble, France, at which the soil around the bracken-roots shows 60 per cent of carbonate of lime and a pH reaction of 8.33 (7 is neutral). Moreover, the climate in this region is wet; the presence of bracken cannot be explained, as has been attempted in other cases, on the hypothesis that in a dry climate little lime can be dissolved in the soil-water.

It should be noted that this applies to the European bracken. It would be interesting to learn if anyone has found the plant of eastern North America in calcareous soil.[3]

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[2] Burkart, Arturo. Observaciones sobre Pteridofitas platenses. **Physis 11: 253–265, fig. 1933.**

[3] De Litardière, R. Un nouvel exemple de station d'Eupteris aquiline en terrain alcalin. Bull. Soc. Bot. France **80:** 230–233. 1933.

Shorter Notes

RATE OF GROWTH OF A PATCH OF EQUISETUM PRAEALTUM.—A very large patch of *Equisetum praealtum* Raf. occupies a considerable portion of the abandoned river bed of the Kansas River south of Manhattan, Kan. This patch, growing as the undergrowth of willow and cottonwood woods, is approximately 2 km. in length and varies from 30 to 70 m. in width. It has been advancing, in the direction of what was formerly down stream, at the rate of from 1 to 2 meters a year in recent years. The patch is an exceedingly dense one, preventing for the most of its extent the growth of other plants.—FRANK C. GATES, *Kansas State Agricultural College.*

EQUISETUM SCIRPOIDES AN EVER-BLOOMING SPECIES IN THE GREENHOUSE.—A patch of *Equisetum scirpoides* Mx., planted in a large pot in the botanical greenhouse of the Ohio State University, began to bloom in September, 1932. It has matured cones every month since that date up to the present time, March, 1934. This species is, therefore, always ready to furnish fresh cones for study in almost any stage of development.—JOHN H. SCHAFFNER, *Ohio State University.*

A RARE RUST ON CYSTOPTERIS FRAGILIS.—When I first became interested in ferns, I examined nearly every plant of *Cystopteris fragilis*, hoping to find a Woodsia or a spleenwort. In one locality I found some fronds of this fern specked with minute orange-colored spots. You can appreciate my satisfaction as well as my ignorance, as I thought it was Rusty Woodsia.

Again last summer I found similar fronds in the same locality—Lake Shehawken, Wayne County, Pa. On one frond was a small grub of the same orange color. I imagined that there might be some relationship between

the grub and what seemed like egg masses. I sent the frond to the Department of Agriculture at Harrisburg, Pa., for determination.

Part of the report follows: "a fungus, the uridinial stage of a rare rust, *Hyalospora Polypodii*. . . . It is of great interest to receive this specimen as it confirms the occurrence of this organism on this particular host.

"It will probably interest you to know that there are but two other known collections of this rust. If it is possible, this office will greatly appreciate receiving a more liberal quantity of this fern on which the rust occurs as an herbarium specimen. The locality and conditions under which the fern is growing are data also desired."

As it is quite likely that other fern collectors have found this rust, I am passing along this report of the assistant plant pathologist of the Pennsylvania Department of Agriculture.—W. L. DIX, *Trenton, N. J.*

DICKSONIA RUBIGINOSA AT MOBILE, ALABAMA.—When I published a list of the ferns of Alabama in Vol. 19, No. 3 of the FERN JOURNAL, I failed to mention a fern that grows in several places in the city of Mobile. This fern is *Dicksonia rubiginosa* Kaulf., and was introduced into this country by Mr. H. P. Loding. Mr. Loding told me that at one time he had been in the importing business. He said he spent a good share of his time in Honduras, Central America, shipping bananas to the United States. He said he found this fern growing in Honduras, and when he quit the importing business he moved to Mobile, Alabama, and brought the fern with him. He gave Dr. Van Aller one of the ferns, which he placed in his back yard.

While I was at Mobile, one day as I was passing along the street in the south part of the city, I noticed a large

clump of ferns growing on the lawn near a house. I at once investigated, and found it to be this same fern that I had seen in Dr. Van Aller's lawn. On asking the lady of the house how it came there, she said that it had been there as long as she had lived there. Whether it was set there, or whether it spread from spores I do not know. There it was growing in great profusion, and was three or four feet high.

As Mobile has freezing weather in December and January, and as all the tender plants are frozen to the ground, it seems that *Dicksonia rubiginosa* had become acclimated and may in time spread to other parts of the state. I mention this that in the event that *Dicksonia rubiginosa* does spread to other localities this may serve to let botanists know how it came to be in the state of Alabama.—E. W. GRAVES, *Bentonsport, Iowa.*

EVERGREEN BOOTT'S FERN. In a region in which I found nothing of interest last summer, I found, during April and early May of this year, that magnificent hybrid, *Thelypteris cristata* × *marginalis*, *T. Boottii*, *T. cristata* and a number of forms of the spinulose tribe.

There was a bit of confusion in naming the *T. Boottii* because my fern book described *T. Boottii* as a fern the fertile fronds of which "wither in the fall." Also the illustration in the handbook did not tally with the fern I found. I sent the frond to Mr. Charles A. Weatherby, who assures me that this fern may be correctly named *T. Boottii* notwithstanding the fact that in this particular case the spinulose characteristic apparently dominates in the persistence of the fruiting frond. Evidently this and other characteristics of these hybrids may vary widely, depending upon which parent dominates.

The *T. Boottii* I found was as large as a well developed *T. spinulosa*, var. *intermedia* and shaped much the same,

except that the broadest part of the frond was quite near the top. The lower pinnae resembled the spinulose, except for webs at the bases of the pinnules. Here the fruit dots were small; toward the top the dots were noticeably larger and the sinuses more nearly resembled those of *T. cristata*. This leads to the conclusion that *T. Boottii* is correctly considered a hybrid.

Since finding the above-mentioned *T. Boottii*, I have found another hybrid that fits more cosely the illustration and description of *Boottii* as found in the handbook. The fertile fronds of this fern did not survive last winter; as to its regular habits I cannot say. The new fronds are of two different forms, the sterile fronds resembling *T. cristata* and the fertile tending more closely toward the spinulose parent. In this particular fern the pinnules of the fertile fronds are more widely separated than was the case with any of the evergreen *T. Boottii* that I examined. It is too early yet to make any study of the fruit-dots on these new fronds.—CLARENCE W. KINNEY, *Worcester, Mass.*

American Fern Society

Dr. Elon Howard Eaton, a member of the American Fern Society since 1927, died at his home in Geneva, New York, March 27th, in his 67th year. Dr. Eaton was perhaps best known for his two volume work on the "Birds of New York," published in connection with the State Museum from 1908–1914. This is one of the first complete studies of birds of northeastern North America ever published, and is a standard work on birds much in demand today.

Not only was Dr. Eaton one of the greatest authorities on birds, but the whole field of natural history of the region was his domain. For nearly thirty years he was head of the Department of Biology at Hobart and Wil-

liam Smith Colleges, and in 1927 was chosen to head the Biological Survey of the Finger Lakes region. He was a keen observer in the field of fern study, and added many specimens to the College Herbarium, and to the distribution records of the State.

For more than two years, ill-health had interfered with his work and he had been given leave to recuperate. He came back from a trip to Iceland last year apparently much improved, but the results of a heart attack a few weeks before his death gave little hope for recovery.

Dr. Murray Bartlett, president of Hobart College expressed the feeling of all who knew him, when he said that Dr. Eaton was "a great scientist, a great teacher, and a most lovable personality," and that to the Biology department his loss was like that of a father.—E. G. W.

Mr. T. Chalkley Palmer, a member of the Society since 1898, died at Media, Pennsylvania, January 31, 1934. Mr. Palmer was born at Media in 1860 and graduated from Haverford College in the class of 1882. In college, he had specialized in chemistry and after graduation pursued advanced work at the Philadelphia College of Pharmacy. He soon became associated with the American Dyewood Co., of Chester, Pennsylvania, of which he was chemist and director until a short time before his death.

He married Miss H. Jane Walter in 1886; she died before him. Two sons survive them.

Mr. Palmer early showed interest and ability in natural history. He was long an active and skillful microscopist, and became a leading authority on the Isoetaceae —in fact, almost the only student of that group in North America. From 1894 until his death he was President of the Delaware County Institute of Science. From 1917 to 1928 he was one of the governing board of the Acad-

emy of Natural Sciences of Philadelphia and its President from 1925 to 1928. From 1916 to his death he was a member of the Board of Managers of Haverford College.

Like the other organizations with which he was associated, the Fern Society has lost a distinguished member, who had given much useful service to science.

Mr. Allan MacCaskill, of Coleraine, Victoria, Australia, has sent in a request which American members of the Fern Society can meet. He is anxious to get "young plants or spores of the Botrychiums, Notholaenas, Cheilanthes, Gymnogrammas, Pellaeas, etc., of United States for cultivation." He adds, "I have not seen any list of the ferns (in the JOURNAL) from Montana, Colorado, New Mexico, Dakota, so far; hope to see such lists soon." The editors join him in his hope with respect to the fern flora of any state which has not been recently or adequately treated. Mr. MacCaskill adds that he is specially anxious to procure specimens of ferns from Oklahoma, Montana, and the other states mentioned above, "as I have none from those states so far."

Report of the President for 1933

In submitting a report for the year just closed, which concludes my fifteenth consecutive term as President, I wish first of all to thank the members for their unfailing courtesy and fine spirit of cooperation, which have made the never very arduous duties of the office agreeable in many ways. I accepted the nomination in the fall of 1918 with a good deal of reluctance and, as I recollect it, with the understanding that a successor should be found within a year or two. How differently it turned out, notwithstanding repeated and fairly insistent efforts on my part to give way to another, is obvious. Finally, however, in appointing a nominating committee early in June, I asked unequivocally that a successor be found. The committee thereupon did its work thoroughly well, as attested by the nomination of Dr. Wherry, whose active field work, special interest in our eastern ferns, and wide acquaintance with the Society's members will prove of the greatest benefit to our organization.

Without attempting to review even roughly the accomplishments and varied activities of the Society during the past fifteen years, I may nevertheless devote a few words to the two important items of growth and publication. Membership has increased by one half during this period. The importance of a large membership had been recognized long before, particularly when the JOURNAL was founded, and was stressed during the presidency of Mr. Bissell (1914–1916), to whose sound judgment in many matters the Society is deeply indebted. Normal increase in membership was accelerated in 1920 and 1921 by the special efforts of a few members and by the circulation of an excellent leaflet, prepared by a committee with Mr. Ware as chairman, which stated briefly the history, purposes, and activities of the Society. For the first time our number passed the 300 mark, in spite of the

necessity of raising the annual dues to $1.50. With increased income the JOURNAL fared better, and an improved JOURNAL helped in turn to attract new members.

The JOURNAL represents, in fact, our most important effort, its functions being to keep the members in touch with each other and the various activities of the Society, including field meetings, to furnish trustworthy information regarding recent advances in fern study, and to serve as a medium of publication for new species, new observations, and interesting accounts of exploration and field studies. It is a diversified and exceptionally well-edited publication, and too much credit can not be given the editors, whose faithful efforts have always commanded as full budgetary support as possible by the Council. With a poorly printed and indifferently edited magazine the Society would have stood still or retrograded, unquestionably.

In one very important respect, however, we have been remiss. I refer to lack of proper attention given to accounting and investments. A brief review of the situation seems necessary.

The funds of the Society are carried in two accounts known as the general fund and the special reserve fund. The first is, of course, for current expenses of administration, publication, purchase of books, herbarium equipment, etc., and includes an "emergency fund" derived from the sale of back volumes and numbers of the JOURNAL. The second, which is in reality an endowment fund, is derived from life-membership dues, with the addition of considerable sums transferred at intervals from the general fund upon order of the Council.

On December 31, 1915, the cash on hand in the general fund was $56.34, and in the special reserve fund $15.00. On December 31, 1931, the date of the Treasurer's last published report, the figures were respectively $1,418.08

and $1,017.41, the total cash assets indicated being therefore $2,435.49. Reports of the Treasurer for these and intervening years are published in the JOURNAL. Considering the character of our organization and the great amount of creditable work performed, this sum, especially the nest-egg reserve fund, was regarded with justifiable pride. The budget had been drawn carefully each year and had rarely been exceeded, and we had invariably carried on considerably within our income. The savings were due to strict economy and the increasing sales of back volumes of the JOURNAL, also to a great amount of volunteer work by a comparatively small number of members, who from the time the JOURNAL was founded, and before, had been drawn closely together by a common interest in ferns and a friendly enthusiasm for advancing fern study. The funds were, naturally, in the custody of the Treasurer, who had held office since the middle of 1915, and were tacitly assumed to be intact and available. Proper attention to their safeguarding and investment was not given by the Council, nor, in fact, is an annual audit of the Treasurer's accounts and the Society's funds even so much as mentioned in the revised constitution of 1914. With cash totaling less than $100.00 at that time, this latter circumstance is not hard to understand, but that none of us should have taken the initiative toward amending the constitution with a view to safeguarding the Society's funds as they increased is now seen to have a grave oversight.

In the latter part of August it was brought to my attention by the editors that printing bills running back to the latter part of 1932 had not been paid. I at once took the matter up with the Treasurer, but without satisfactory results. After a good deal of correspondence, largely with the nominating committee (whose work had become increasingly difficult) I appointed on November

15 a special committee consisting of Mr. Ware (Chairman), Mr. Hunnewell, and Mr. Weatherby, whose duty should be to consider the constitution of 1914 with a view to amendment or revision, and I further authorized and instructed this Committee to investigate as fully as seemed desirable the management and activities of the Society, giving special attention to finances, and to report its findings and recommendations to the President. Because of inability to obtain adequate data from the Treasurer, the committee had not been able to complete its report at the time of my leaving office. This will of course be made to Dr. Wherry, under whose guidance all necessary steps will be taken. Whatever develops, members may rest assured that the Society will continue to function in a live way. We have always practiced economy, and shall be able to carry out our usual activities on current income alone, if necessary. The support of all members will, I know, be given cordially to the new Council.

Respectfully submitted,

WILLIAM R. MAXON, *President*.

Taking over office with the Society's affairs in the state referred to in the report of the retiring President, the present incumbent requested the Committee of Investigation to continue their work. The report of their progress to date is printed below. It may be added that funds have been borrowed to cover the amounts of the printers' bills left unpaid by the former Treasurer, and that these funds are being repaid in quarterly instalments from our current income. It has correspondingly been necessary to decrease the size of current issues of the JOURNAL slightly, but we hope to be able to expand it again before very long. Meanwhile it is hoped that all members who

have not paid their dues up to date will make a special effort to do so immediately, and that all of our members will try to induce their friends who are interested in ferns to join the Society.—EDGAR T. WHERRY, *President*, 1934.

Dr. Edgar T. Wherry, President, American Fern Society:

The committee appointed last fall by President Maxon to investigate the affairs of the Society has not completed its work, largely because of the difficulty of getting any information from the late treasurer.

We have discovered, however, that the Society had, on December 31, 1933, practically no funds, though it was estimated, on the basis of the treasurer's reports and the known income from dues and subscriptions, that it should have had approximately $3,000. It now appears that the late treasurer has been taking the Society's moneys from time to time, under the guise of loans to his wife, without the knowledge of any of the other officers or authorization by them.

There has recently been received from the ex-treasurer an unsecured note, signed by his wife, Pearl E. Underwood, and endorsed by him, for $3,200, which presumably represents the cash, plus interest to the end of 1933, which he has thus appropriated to his own uses.

The committee is continuing its efforts to ascertain if there are available any assets which may serve as security for the proffered note. A complete report will be made as soon as possible.

ROBERT A. WARE, *Chairman*
F. W. HUNNEWELL
C. A. WEATHERBY
Committee on Revision and Investigation

MAY 15, 1934

Report of the Treasurer for 1932-1933

GENERAL FUND

Balance Jan. 1, 1932			$1,418.08
REC'D Subscriptions to Journal		$ 151.35	
Dues 1930		$ 4.50	
1931		22.50	
1932		428.00	
1933		356.60	
1934		22.60	
1935		3.10	
			837.30
Exchange			1.32
Back Numbers			24.84
Illustrating			1.00
Advertising			9.00
Reprints			27.40
Miscellaneous			4.25
Interest			177.63
			1,234.09
			$2,652.17
PAID Treas. expenses			$ 72.20
JOURNAL			307.82
Exchange			1.25
Bad Checks			7.50
Tax on checks on bank charges			1.45
Reprints			6.67
Refund—Bishop Museum			12.37
Binding Journals			3.00
Sec. Expenses			18.37
Printing members-list			36.16
Set of Journals for Library			6.37
H. C. Fiedler bill			4.95
			$ 478.11
Balance Dec. 31, 1933			2,174.06
			$2,652.17

Of this balance $478.69 is carried in the Emergency Fund.

SPECIAL RESERVE FUND

Rec'd. Balance Jan. 1, 1932		$1,017.41
Interest		113.81
		$1,131.22

GENERAL FUND

Remitted from Bank	$	90.35
Old Balance in State Nat'l Bank, Windsor, Vt.—closed		12.40
Note—P. E. Underwood		2,071.31
		$2,174.06

RESERVE FUND

Balance in Savings Dept. State Nat'l Bank, Windsor, Vt.—closed	$	2.53
Note—P. E. Underwood		1,128.69
		$1,131.22

Note—P. E. Underwood	$2,071.31	
including Interest to Dec. 31, 1933	1,128.69	
		$3,200.00

(Signed) J. G. UNDERWOOD

The Torrey Botanical Club has announced a number of trips of special interest to fern students, and members of the American Fern Society are cordially invited to attend:

Sunday, July 1. Meet at Chatsworth, New Jersey, 11.00 A. M., D. S. T. Leader, Dr. W. W. Wilson, whose car will bear placard "Torrey." *Schizaea* will be seen.

Sunday, July 15. Meet at Sparta, N. J., railroad station 10.30 A. M., D. S. T. Leader, Prof. James L. Edwards. This locality in the Highlands probably has the richest fern flora of any place in the New York region.

Sunday, July 22. Meet at Point Pleasant, N. J., railroad station 11.00 A. M., D. S. T. Leader, Prof. V. L. Frazee. *Lygodium* and pine-barren plants will be seen.

Alternative trip on same date: Meet at Hewitt, N. J., railroad station, 10.15 A. M. Leader, Mr. W. L. Highton. *Ophioglossum* and various ferns of upland regions will be seen.

(Saturday, September 1, to Monday, September 3 (Labor Day). Annual outing of the American Fern Society, to be held this year at Lancaster, Pennsylvania. Details to be announced to members later; keep the date open.)

Saturday, September 8. Visit to fern garden of Mr. W. Herbert Dole, 23 Overlook Ave., West Orange, N. J., 2.30 P. M., D. S. T. Train to Mountain Station on Lackawanna Railroad, or drive from Newark through Central Ave., to its end, in West Orange, then left into Valley Road, right into Lawrence Ave., and left into Overlook Avenue.

NOTICE FOR NEW MEMBERS.—The original and present chief purpose of the American Fern Society is to serve as a means of promoting the study of ferns by its members. In this connection, the Society publishes from time to time a membership list, by which new members may become acquainted with others of like interest in their neighborhood.

The Fern Society maintains also two loan collections, an herbarium, under the curatorship of Prof. Lewis S. Hopkins and a small library kept at the Brooklyn Botanic Garden. Provisions for borrowing specimens are indicated on the second cover-page of the FERN JOURNAL. Provisions for borrowing books, together with an extensive list of fern books available for lending, are given in a pamphlet published by the Fern Society, and available for new members.

There also remain copies of a specially reprinted Key to fern species prepared by Dr. C. E. Waters.

If there are any recent members of the Society who have not received copies of these three items—membership list, Waters Fern Key, and the library list—they will be sent on application to Dr. Ralph C. Benedict, American Fern Society, Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn New York.

New members:

Fox, Walter H., Hartford, Mich.
Hayes, Mrs. Edwin A., 466 Elm St., New Haven, Conn.
Howell, Miss Ida Oatley, Scotch Plains, Free Acres, New Jersey.
McCoy, Thos. N., Catlettsburg, Ky.

Changes of address:

Brown, Hubert H., 71 Weatherall Ave., Toronto, Ont.
Kaufman, Miss Pauline, 83 Argyle Road, New Rochelle, N. Y.
MacFadden, Mrs. J. P., 6126 Melvil St., Culver City, Cal.
Palmer, E. J., 1090 Centre St., Jamaica Plain, Mass.

I should like very much to exchange specimens with some of the members of the Fern Society. I can offer most of our Florida ferns, including filmy. I especially want curly grass and the Botrychiums other than *obliquum* and *virginianum*.—MRS. E. PETERSON, R. D. Box 468, Miami, Fla.

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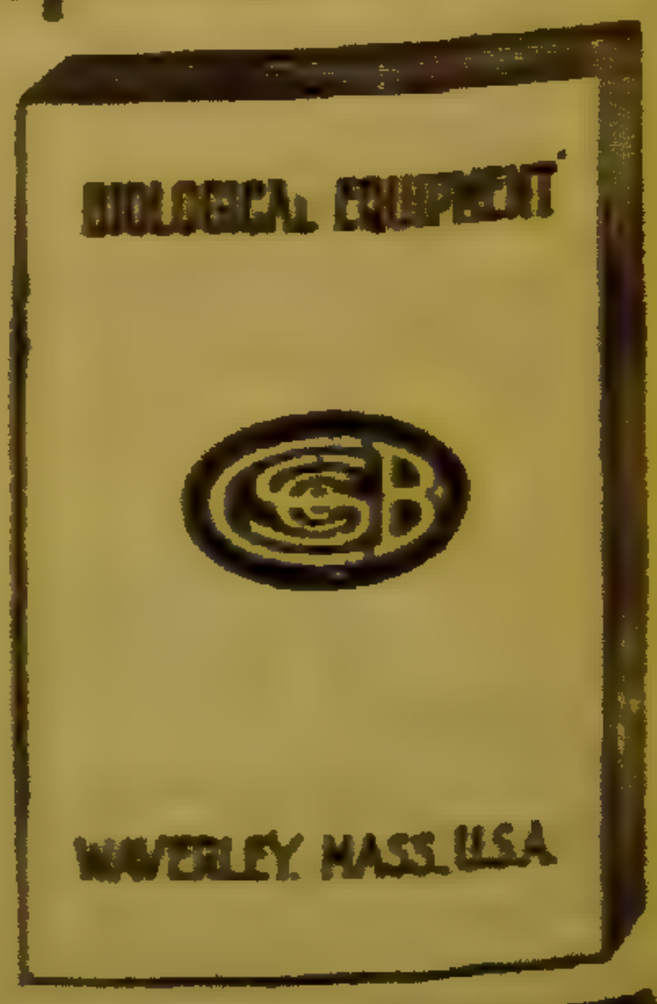

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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

VOL. 24 JULY–SEPTEMBER NO. 3

Saving the Scolopendrium Fern

HOMER D. HOUSE

The vicinity of Jamesville, Onondaga County, New York, is classic ground to both the geologist and the botanist. Across the outcropping Onondaga limestone on both sides of and above the present level of the valley of the Butternut creek and almost at right angles to the present north and south placement of the valley are the famous postglacial gorges caused by the eastward flow of the outlets of the postglacial Lake Onondaga. In 1807 Pursh discovered the Hart's-tongue fern near Geddes, southwest of the city of Syracuse. In 1830, William Cooper found the fern at Chittenango Falls, a few miles southeast of Syracuse. Meanwhile the two localities where the fern was most abundant remained unknown until found by Lewis Foote in 1866 near Jamesville, and in the same year by J. A. Paine, Jr., at "Little Lakes" (Green pond and White or Blue lake), about a mile east of Jamesville.

Two small bodies of water, Green lake (2 miles west of Jamesville) and Green pond (1 mile east of Jamesville) occupy the plunge basins of waterfalls along the course of the extinct postglacial rivers, the beds and gorges of which form such a conspicuous element of the local geology. It is probable that Rafinesque visited one

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of these small lakes in 1826 (Life of Travels, p. 82) when, in company with Prof. Eaton, he speaks of visiting several localities in central and western New York, and "a small singular nameless lake, an extinct volcano crater, without outlet." He says that he had full time to collect and carry numerous specimens, but unfortunately lost most of them afterwards. "Unfortunate" seems to be the best English name for Rafinesque's American Nemesis. It was indeed unfortunate that if he did visit one of these lakes, as seems probable, he should have associated more or less stratified Devonian limestone formations with volcanic phenomena, curiously so in view of his familiarity with the volcano of Etna, and his rather remarkable observations upon stratigraphy made a few years earlier.

Probably neither botanist nor geologist has ever visited this remarkable locality without feeling deeply impressed with the evidences of the rugged forces of nature which have so deeply engraved their power upon the visible landscape. Especially does the botanist, as he explores the rock strewn "pot holes" and gorges feel that he has been transplanted suddenly to something akin to a different world. It is not strange therefore. that the botanical literature covering this section of the state should contain many references to the vegetation and especially the ferns of these cool, densely shaded, rock-strewn gashes in the earth's crust. For our most complete knowledge regarding the fern flora of this region we are indebted to Dr. L. M. Underwood, at one time professor of biology at Syracuse University (Fern Bulletin **5**: 54–55, 1897), but we should not overlook the many other contributions to the knowledge of the flora of these lakes and their vicinity made by Mrs. S. M. Rust, H. E. Ransier, Mrs. L. L. H. Goodrich, Dr. William R. Maxon, Dr. Loren C. Petry and Miss Mabel R. Hunter.

(Courtesy of the Brooklyn Botanic Garden.)

GREEN LAKE AS IT USED TO BE.

Several years ago the region around Green lake west of Jamesville was acquired as a State Park under the custody of the New York State Museum, thus preserving for all time its geological features. The jurisdiction of this area, known as the Clark Reservation, has since passed into the hands of the New York State Park Board. It was hoped that its natural vegetation might also be preserved, including the Hart's-tongue fern which was found in several places within the tract, but it soon became apparent that the public at large, certainly many of those who frequented the park for recreational purposes, had little conception of the value and importance of the conservation and preservation of those elements of wild life, both plant and animal, which form such an important element of beauty of the great out-of-doors, and without which such areas soon lose their recreational value to the many who place a somewhat higher value upon natural beauty than upon the number of beer and ice cream stands. It is not, however, a hopeless cause, and there is every reason to believe that with adequate protection this reservation may become the safe abiding place of the many rare plants which are native to the region.

Botanists in general and fern students especially were not a little grieved to learn some years ago that the much larger area east of Jamesville, including Green pond, White lake and the long rough and irregular escarpment extending eastward nearly to Manlius, had passed into the hands of the Solvay Process Company, whose intention it was to convert this great deposit of limestone into commercial products. The commercial demands for easily available deposits such as these are undeniable, but it will always be a matter of great regret that it had to be this particular area which was invaded. Green pond and the long escarpment, as well as most of its forest cover, are now but a memory.

(Photograph by H. E. Ransier.)

The Hart's-tongue Fern, Phyllitis Scolopendrium, as it formerly grew on the shaded talus of Green lake, east of Jamesville, Onondaga County, New York.

During 1924 and 1925 through the interest of many fern students a movement was finally crystallized by Dr. J. B. Todd, of Syracuse, for transplanting the Hart's-tongue fern from the path of the quarrying operations to safer quarters in the Clark Reservation and elsewhere. This had the sanction of the vice-president of the Solvay Company, which was about all the interest shown by them in the matter.

It is not the purpose of this account to dwell in detail on what is doubtless one of the most ambitious attempts ever made to save from destruction a rare plant. It is sufficient to say that Dr. Todd, with the assistance of Miss Nettie M. Sadler, professor of biology in the Nottingham High School, Syracuse, and Miss Mary E. Todd, in charge of the department of science in the New York Public Library, removed and planted elsewhere a total of nearly 700 plants of the Hart's-tongue fern, with what labor and physical difficulties the reader is left to imagine. Most of these plants are doing well in their new homes, some of them remarkably so. A few have suffered from heavy rains and other unfortunate or unforeseen circumstances and conditions. Considering the difficulties of getting the plants out and transplanting them to their new locations the percentage of survivals is truly remarkable. Only those who have attempted to explore the haunts of the Hart's-tongue fern in this region can appreciate what the enterprise involved.

Fern students above all, and all those in any way interested in the conservation and preservation of rare forms of wild life, owe to these three individuals, and others who may have assisted them, a debt of gratitude for which there is no visible remuneration. Our sincere thanks and their knowledge that without thought of any reward they have laboriously accomplished something

really worth while will constitute their chief compensation.

An interesting and valuable contribution to this work of salvage was made by Mr. H. E. Ransier, of Manlius, N. Y., who gathered up the stray plants left behind by the first party and, locating other clumps in the path of the quarrying operations, distributed live plants to fern lovers all over the country who would undertake to set them out in suitable surroundings. In this way the fern has been distributed far and wide under circumstances which do not affect the existence of the species, since the plants thus distributed would otherwise have been destroyed, and the fern may find in many other localities a favorable place for its growth and increase.

The threatened destruction of the fern also stimulated experiments upon its propagation by Dr. Ralph C. Benedict at the Brooklyn Botanic Garden, where it has been successfully grown from spores, and the mature plants thus produced may become available for further planting under suitable surroundings. Shaded, cool, moist limestone talus, preferably with a north or east exposure, offers the most desirable situations, and it is to be hoped that efforts will be continued to place the fern in many such situations which exist throughout the northeast. That the fern will succeed under even less suitable conditions is well known and there is good reason to hope that the Hart's-tongue may become naturalized in many places.

At Chittenango Falls, where the plant is also native many of the best clumps were destroyed by the management of the State Park Board in charge by the construction of a graded path along the side of the cliff and talus where the fern grows. To what extent this may affect the fate of the fern in this locality is not yet certain.

NEW YORK STATE MUSEUM, ALBANY, N. Y.

New Tropical American Ferns--XII[1]

WILLIAM R. MAXON

The present instalment contains descriptions of two new species from Colombia and Panama. The *Asplenium*, though belonging to a group of species that are difficult to describe at all briefly, is actually well marked and has been repeatedly collected. The *Oleandra* is known from a single recent collection.

Asplenium membranifolium Maxon, sp. nov.

Rhizoma breviter repens, tenue, subcarnosum, nodulosum, paleis fuscis subfiliformibus praeditum. Folia pauca, contigua, recurvata, usque ad 18 cm. longa, stipitibus tenuibus viridescentibus vel pallide brunneis anguste marginatis quam laminis multo brevioribus; laminae membranaceae, glabrae, ovato-oblongae vel triangulari-ovatae, longissime acuminatae, 8–14 cm. longae, pinnatae; pinnae majores 3–6-jugae, patentes, plerumque oppositae et trapezio-oblongae, apice acutae vel rotundato-obtusae (basales interdum obtuse deltoideae vel sublunatae), subgrosse crenato-serratae vel leviter incisae, crenaturis singulis, binis, vel ternis, 1–2 mm. longis et latis; nervi mediani tenues, flexuosi, nervulis obliquis plerumque semel vel bis furcatis; sori distantes lineares, indusiis angustis membranaceis et fragilibus.

Rhizome short-creeping, 1–2 cm., long, 1.5–3 mm. thick, nodulose, firmly carnose, brownish-felted, closely paleaceous; scales 2–3 mm. long, subulate-attenuate to subfiliform, strongly clathrate, the cells linear, with heavy fuscous partition walls. Fronds 2 or 3, adjacent, laxly spreading, 10–18 cm. long, the stipes much shorter than the blades, delicate, compressed, greenish or light brown and green-marginate, scantily paleaceous toward base; blades ovate-oblong to deltoid-ovate, conspicuously long-acuminate, 8–14 cm. long, 3–6 (8) cm. broad, fully pinnate in lower half, the upper segments semiadnate

[1] Published by permission of the Secretary of the Smithsonian Institution.

and decurrent, the uppermost short and broadly joined below the lobed or coarsely crenate-serrate attenuate apex; principal pinnae mostly opposite, spreading, broadly excavate at proximal base, thus inequilateral, mostly trapeziform-oblong, acuminate to broadly rounded at apex, the basal ones slightly shorter or not, variable, ranging from obtusely deltoid or broadly sublunate to lance-trapeziform; margins singly or doubly crenate-serrate or sometimes lightly incised above, an auricular basal lobe rarely developed; veins 7 or 8 (10) pairs, distant, the distal basal one subflabellately branched, the others mostly once-forked or the apical ones (especially on proximal side) simple, oblique; sori 6–8 (10) pairs, medial, narrowly linear, 2–5 mm. long, nearly straight, the pale membranous indusium subentire, occasionally diplazioid. Leaf tissue very delicately membranous, fragile, light green, glabrous.

Type in the U. S. National Herbarium, no. 863,072, collected near Chivi Chivi River, Juan Díaz region, about 10 miles east of Panama City, Panama, on moist bank of stream, Oct. 11, 1917, by Ellsworth P. Killip (no. 2567). Other material examined is as follows:

PANAMA: Juan Díaz, on wet banks, *Killip* 2597; Río Técumen, Prov. Panamá, in moist forest, *Standley* 29372; Río Tapia, Prov. Panamá, frequent in wet forest, *Standley* 26169; hills west of the Canal, near Gatún, Canal Zone, common on wet shaded rocks, *Standley* 27218; Alhajuela, Prov. Panamá, in woods, *Killip* 2670; without definite locality, *Seemann* 369.

COLOMBIA: Torrecilla, near Turbaco, Dept. Bolívar, alt. 150–300 meters, on limestone rocks in dense woods, ***Killip & Smith* 14658.**

Asplenium membranifolium is apparently not uncommon in the lowlands of Panama. The exact locality for the Seemann plant at Kew, marked by Hooker as a provisional new species, is not given, but most of the other Panama specimens are from the region of Juan Díaz, at only a little above sea level. The single collection from a near-by part of Colombia is obviously identical.

Some of these specimens were at first labeled *A. obtusifolium* L., but the relationship is actually not so close as might be expected from their similarly felted, nodulose, subcarnose rhizomes. In *A. obtusifolium*, not only are the rhizome scales brown, deltoid-ovate, few, obscure, and confined to the growing point, but the fronds are numerous, the rachises coarse and flexuous, the pinnae variously lobed, with margins subentire to irregularly serrate or sharply erose-dentate, and the firm succulent, dark green leaf-tissue is strongly reticulate in drying. These points are all in marked contrast to *A. membranifolium*.

Oleandra Archeri Maxon, sp. nov.

Rhizoma scandens ramosum, paleis laxe ciliatis castaneis subulatis adpressis late imbricatis vestitum. Folia pauca erecta, phyllopodiis elongatis inter se 3–4 cm. distantibus, stipitibus quam laminis multo brevioribus; laminae symmetricae, elliptico-oblongae, basi acutae, apice abrupte acuminato-caudatae (acumine ipso subfiliformi), usque ad 20 cm. longae, subcoriaceae, late ochraceo-marginatae, glabrae, costa ut videtur nuda, nervis plerumque geminatis crebris; sori numerosi dispersi, indusiis glabris subpersistentibus.

Rhizome scandent, branched, 1.5–2 mm. thick, appressed-paleaceous; scales widely imbricate, subulate-attenuate, about 6 mm. long, 0.3 mm. broad at punctate attachment (2 mm. above the narrowed base), thin, castaneous, laxly fibrillose-ciliate. Fronds few, erect, 15–27 cm. long, glabrous throughout; phyllopodia slender, 6–15 mm. long, paleaceous at base; stipes 2–7 cm. long, 1 mm. thick, olivaceous, naked; blades 12–20 cm. long, 2.5–4.5 cm. broad, narrowly elliptic-oblong, acute at base, abruptly acuminate-caudate at apex (the tip 1–2 cm. long, 1–2 mm. broad), subcoriaceous, broadly cartilaginous-marginate; costa elevated, sulcate and ochraceous above, beneath rounded, olivaceous, naked; veins arising singly or in pairs (the proximal often forked), hyaline by transmitted light, the branches close, 22–27 per cm.

near the margin; sori about 1 mm. in diameter, very numerous, irregularly disposed, singly, in groups, or in short rows; indusia orbicular-reniform, glabrous, thin, shriveling, subpersistent.

Type in the U. S. National Herbarium, no. 1,540,083, collected between La Oveja and Quibdó, Intendencia del Chocó, Colombia, on tree stump, April 1–2, 1931, by W. A. Archer (no. 1669).

The present plant is not very closely allied to any of the American species discussed in the writer's revision of this group.[2] It seems more nearly related to *O. Duidae* A. C. Smith,[3] from Venezuela, but that is a much larger plant, with rhizome scales up to 0.8 mm. broad, blades long-acuminate at apex (rather than abruptly acuminate and narrowly long-caudate), and veinlets only 13 to 16 per centimeter.

WASHINGTON, D. C.

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[2] Contr. U. S. Nat. Herb. 17: 392–398. 1914.

[3] Bull. Torrey Club 58: 301. 1931.

Success with Ferns

DR. M. R. SHARPE

Someone has said, "Everyone should have a hobby even if it is collecting pieces of string." My wild flower search brought me in contact with the ferns some ten or more years ago and with the moving of wildings to my small place, I began taking attractive ferns as I came across them. Following a near completion of the more unusual and rare wild flowers, I turned my efforts toward a fern collection and for over five years have been adding to my collection through personal search and exchange until I have had about 90 varieties.

Some of these I have been unable to grow successfully through our New England winters, particularly those from below the Mason and Dixon line and from the lower part of California. Going into the past winter season my garden contained over 70 varieties and I am now wondering how many will be missing during the coming season to survive the extreme low temperatures over a protracted period of the hardest winter we have had since records have been kept.

In gathering these ferns together from the northern part of our country, only one variety has been purchased, all others not native to this section being obtained through exchange or by gift from people acquainted with my hobby. I know that I have written several hundreds of letters in making contact with fern lovers and am still looking in magazines for new chances for exchange as I am a pure amateur and have nothing to sell. Many of these letters fell on barren ground and resulted in no accessions to my collection, while others brought me a single specimen or several new ones that I needed. On the whole I have found people very kind and gracious in

the matter as a free-masonry exists among fern and flower lovers which I doubt exists among other collectors.

Unfortunately I know little of botany but have studied all available books and descriptions of families and individuals. However, words in cold type fail to differentiate between closely allied ferns and I pay my respects to Mr. C. A. Weatherby for his kindness in identifying a goodly number for me.

Suggestions in print and by word of mouth as to the proper time and method for taking ferns from their native haunts, I have found of little benefit. From my experience they can be taken at any season they can be dug, provided that due care is taken in lifting them and cutting back severely the season's growth, except in early Spring. Making a practice of taking half a pail or more of the soil in which the plant grows and simulating as near as possible native conditions, means the difference between success and failure. Such transplants should be well watered for a week or ten days, depending upon weather conditions.

Perhaps the members of the grape-fern family are the most difficult for me to grow but I have found that most of these if taken with a good circle of sod, cut deep enough to protect the fleshy roots, will thrive nicely if planted in sod. The matricary and lance-leaved grow well in semi-shade in a soil mainly of leaf mould which needs constant watching to provide a good moisture content. I am not sure but that a goodly part of my success is due to plenty of moisture supplied nearly every night during the hot weather months by a fine spray from the garden hose. *Polypodium polypodioides* lived through two winters with me before I lost it but shall try it again this season if I can obtain it.

Ferns that are not native here are planted in a rockery of native field stones built on an ash pile and which is

shaded the greater part of the day by an old apple tree and my house. The pockets between the rocks are well filled with wood soil which I think must be of an acid nature as I have dug it all from one spot under pine trees. However, in making my exchanges I ask that a goodly amount of soil in which the plant grew, be sent along with it. This adds somewhat to my postage account but usually assures the life of the fern in its new home.

In such an article in the valuable JOURNAL, of course it is impossible to go into much detail relative to the treatment of any particular variety but I would be very glad to give any possible information to any of the readers interested. I have experimented with several methods in my attempts to grow the Hart's tongue from spores, thus far without success. Kind friends have offered further suggestions which I shall attempt next season. The Walking fern may be readily increased by putting the tips of the fronds in small pots filled with sphagnum, which must be kept moist.

Fortunately I have a dry wall with an easterly exposure where rock, Christmas and ferns of the evergreen type give a pleasing view during the cold weather months. Another pleasing effect is obtained by several half-barrel bogs where the Adder's tongue appear perfectly happy with a number of native orchids, Pitcher plants and Cardinal flower. By this means I can grow a number of bog plants not usually found in a home garden.

On a number of occasions I have been asked to give a "Fern Talk," during which I show about thirty live ferns packed in sphagnum and covered with oiled paper. These are properly labelled with common names and are handed through the audience. Through such talks I have interested a number of persons sufficiently so that they

too are making a fern garden. The frequent remark during such talks is, "I thought a fern was a fern. I had no idea there were so many kinds."

UXBRIDGE, MASS.

Notes on Some Ontario Pteridophytes

T. M. C. TAYLOR

During the past few years some interesting records of Ontario pteridophytes have come to the writer's attention, and as the distribution of the pteridophyte flora of Ontario is very imperfectly known some of the more interesting of these new stations are here placed on record. With a view to bringing up to date our knowledge of the vascular cryptogams of this province the writer would welcome information from any botanists who have collected in this region and would be glad to reciprocate in the exchange of specimens. Information concerning the eastern part of northern Ontario would be especially welcome.

The following records are based on specimens in the herbarium of the Department of Botany, University of Toronto, unless the numbers be otherwise designated.

ASPLENIUM CRYPTOLEPIS Fernald. The first record of this fern in Ontario was published by Burgess (1892) who reported its discovery on Flower Pot Island, not far from Tobermory, Bruce Co., Ont., by P. J. Scott, of Southampton, Ontario, on Sept. 6, 1892. (Geol. Surv. Can. No. 105,577). In August, 1901, Dr. Scott also found it "on rocks, north end of Manitoulin Island" (Geol. Surv. Can. No. 66,415). Up until 1933 no new stations in Ontario have been added as far as the writer is aware, nor does there appear to be any published rec-

ord of its re-collection on Manitoulin Island. Curiously enough last summer it was discovered on the mainland of the Peninsula quite independently by Prof. G. L. Stebbins, Jr., and the present writer. Prof. Stebbins has kindly permitted use to be made of information, contained in a letter to the writer, concerning his discovery. His first collection was on June 20th at a point a few miles north of the little village of Dyer's Bay, just beyond the outlet to Gillies' Lake. His second was on June 25th in the vicinity of Lion's Head (Jenkins & Stebbins No. 5). My own collection was made less than a mile north of Dyer's Bay (Univ. of Tor. No. 6132) on August 24th. A large number of plants were noted, always growing in dry, horizontal crevices in large blocks of dolomite that had fallen from the cliff. It is interesting to note that they were found only on the sunny sides of the blocks, being usually in full sun for a good portion of the day. As there was nothing very peculiar about these sites it is more than likely that this odd little fern may be locally distributed for some distance along the east coast of the Peninsula.

ASPLENIUM PLATYNEURON (L.) Oakes. This characteristically southern fern has previously been reported from Ontario by Klugh (1906) in the counties of Frontenac, Hastings, Leeds, Lincoln, Prince Edward and Welland. In the late autumn of 1931 the writer collected several specimens in Matchedash Township, Simcoe Co. (Univ. of Tor. No. 13). and last autumn was shown a specimen obtained at Gravenhurst, Muskoka District, where it is said to be locally fairly common. Its most northerly station in Ontario at the present time is at Port Sidney, Muskoka District, where a small colony was located by Mr. H. H. Brown, of Toronto. These three stations are all on the Laurentian shield, the plants growing in sod

in the open, usually in fairly close association with an exposure of rock.

LYCOPODIUM SABINAEFOLIUM var. SITCHENSE (Rupr.) Fernald. Many years ago the late Prof. John Macoun in his Catalogue of Canadian Plants reported this species from the Magpie River, Algoma District. This report has since been quoted by Klugh (1906) and Jennings (1918) in his comprehensive discussion of the pteridophytes of northwestern Ontario makes reference to it. So far as the writer is aware there have been no more recent published reports from northern Ontario, nor in fact from anywhere in Ontario. It is of some interest, therefore, to note that in a small collection of pteridophytes presented to the University of Toronto by Dr. R. F. Cain is a good specimen of the above species (Univ. of Tor. No. 6356) collected "in coniferous woods" at White River, Algoma District, in September, 1926. This is in the same general region as reported by Macoun, but gives a definite and readily accessible location, about five minutes' walk from White River station on the Canadian Pacific Railway.

PHYLLITIS SCOLOPENDRIUM (L.) Newm. Twenty-five years ago J. F. Calvert (1908) published a short note on the discovery of this fern in Dufferin Co., near the village of Mono Centre. This note came to the writer's attention quite by accident in 1932 when searching for another paper. As the station was described in some detail with reference to lot and concession numbers a small party set out to see whether after twenty odd years the colony was still thriving. This expedition, due to local misdirection, proved fruitless and the search was not renewed that year. In the early autumn of 1933 Mr. Paul Hahn, of Toronto, mentioned casually that he had known for many years of the Hart's Tongue station at Mono Centre and as a matter of fact had been there only a week or so pre-

viously. His kind offer to act as guide was accepted with alacrity, with the result that the station was found without any difficulty. Instead of the half dozen plants mentioned by Mr. Calvert, they were present literally by the hundred, growing, as always in Ontario, in the damp, shady talus of the Niagara escarpment. There is no doubt that this colony has increased greatly in numbers during the past two decades and the presence of numerous young plants indicates that it will continue to increase in the future unless it falls a prey to vandals. This chance fortunately seems remote as the station is well removed from the ordinary paths of tourist and picnicker.

POLYSTICHUM BRAUNII var. PURSHII Fernald. In June, 1932, while collecting in wet mixed woods near Nestleton Station, Durham County, the writer was greatly delighted to find a single healthy specimen of this species growing in complete shade in a fairly damp part of the woods (Univ. of Tor. No. 619). A careful search revealed no other individuals near-by, nor has it apparently been recorded previously from this part of the province. Mr. C. A. Weatherby kindly supplied the following information by letter: "I find no published record of it from that province (Ontario), but we (Gray Herbarium) have a single specimen collected on 'rich wooded bank near Agawa River, Agawa Bay, Algoma District, Ontario, 21 June, 1921,' by A. S. Pease, No. 17,964." These two stations are widely separated from each other and also from other stations. The nearest published record to the Agawa River station is Keweenaw Co., Michigan, where it was collected by O. A. Farwell (Dodge, 1912). The Durham Co. station indicates a western extension of some 160 miles from Chelsea, Que., where it has been collected several times. A careful search will probably fill in the gap between these two stations.

WOODWARDIA VIRGINICA (L.) Sm. During the summer of 1933, Mr. P. V. Krotkov, of the Department of Botany, University of Toronto, while collecting in the vicinity of Tobermory, Bruce Co., discovered several colonies of chain fern in an old, practically dry blueberry swamp near the main road within about two miles of the village of Tobermory. This is the first record from Bruce Co. and marks a decided northwesterly extension of its range in Ontario. The plants (Univ. of Tor. Nos. 6304, 6122), which were all growing in full sun, were for the most part yellowed and impoverished, due no doubt to lack of shade and moisture. Colorimetric determination of the soil acidity made in the field showed a reaction of pH 4.5–5.0. The future prospects of this outlying station are not of the best as the drying up of the swamp makes possible the spread of ground fires which are apparently started nearly every summer through the carelessness of local blueberry pickers. During the past year fires were smouldering from early in the summer until well on into September.

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DEPARTMENT OF BOTANY.
UNIVERSITY OF TORONTO

A Vermont Fern Garden

E. M. KITTREDGE

The fern garden belonging to Mrs. Chisholm, of Proctor, Vermont, is of great interest to me because I was allowed to share in it, and a brief description of some of its main features may be of interest to others. The lawn on the eastern side of the house slopes rather abruptly toward a grove of young White Pines, and between the lawn and the edge of the grove a narrow concrete runway was constructed several years ago having connection with the water main, so that when a cleverly concealed cock is opened a very nice little brook ripples gaily along and under a rustic bridge, where it loses itself in a small pool. Many plants of the more common of the native ferns are planted along both sides of this brook, with a goodly sprinkling of Violets and Forget-me-nots, and a few early blooming "garden" plants which later are hidden by the growth of ferns. On the grove side of the brook and near the bridge, many stones carefully selected and brought in from a distance in many trips of the accommodating Ford were arranged by Mrs. Chisholm and much good and proper earth was pressed into every crack and cranny. Here many of the rock-loving species found in this state were tenderly set, and, more to the point, here they grow in great contentment. Walking Fern, Wall Rue and Maidenhair Spleenwort peep out from small crevices, Ebony Spleenwort stands with dignity at the base, and several plants of unusual forms, as well as the common form, of the Polypody crown the top of this "crag"—all these on the sunny side. On the other side of the crag, which is always in the shade, more of these plants also grow, and associated with them are the rare variety of the Ebony Spleenwort, *Hortonae*, a fine plant of Scott's Spleenwort,

a plant of the Green Spleenwort, and the variety *cambricoides* of the Polypody. An error of judgment caused us to place the plant which has since been determined to be a variety of the Marginal Fern, among the Polypodies on the top of the crag, and now we are afraid to move it lest it die. Just inside the edge of the Pine grove are many plants of Christmas Ferns all brought in from the nearby hills, and all differing in one way or another from the common form and from each other, among them being a fine plant of the variety *lanceolatum*, and one of the variety *multifidum*, and at least two others which may receive varietal names some time. Broad Beech, Long Beech and the delicate Oak Ferns all grow here, and there are plants of Goldie's Shield Fern, Massachusetts Fern (sent from Rhode Island), Spinulose Fern and its intermediate and widespreading varieties, Lady Ferns in great variety, including one which we have named the "skeleton" because of its wraith-like fronds, Silvery Spleenwort, with two forms, one crested and one with a red rachis, and a much curled and crisped form of the Sensitive Fern. At one end of the bridge a plant of the lovely Climbing Fern sent by a friend from another state, makes a brave showing, and some interesting forms of both Male and Marsh Ferns—of the latter the variety *Pufferae* is conspicuous—sent from various places make themselves at home. Beyond the bridge the Narrow-leaved Spleenwort, Male Fern, Crested and Clinton's Shield Ferns and the Net-veined Chain Fern—this from Rhode Island—share the shade with some rare flowering plants. The Virginia Chain Fern, brought in from one of the three known stations in Vermont, did not live. Some of the Shining Club Moss was brought from its home in the deep woods, and is living comfortably with some Gold-thread plants. Several "pieces" of true Mosses have been brought in

from time to time, and placed where they would look well, and help to cover some gap until the ferns should be well grown, and strange to say a few of them have found the new resting place a pleasant home. No trip to the woods, nearby, or at a distance, for a picnic or just a stroll, is made without thought for the fern garden, and some very beautiful plants of the most common species have thus been brought in to add beauty and grace, while several of the excursions have resulted in finding some of the rarest and most unusual forms and varieties known.

WOODSTOCK, VERMONT

More Fern-Garden Lists

Six more fern-garden lists have been received and are here printed for the information and encouragement of other members. It is hoped that more—many more —will follow, so that the census of hardy ferns in cultivation which is the object aimed at in asking for these lists, may be as complete as possible. As an aid to reconciling the rather different nomenclature of the lists, it may be remarked that, so far as the species here given are concerned, *Aspidium*, *Dryopteris* and *Thelypteris* are the same thing. So are *Dicksonia* and *Dennstaedtia*.

We have 85 species and varieties of fern according to the following list, all of which have been established for at least two years. The plants of many of the varieties were bought, while spores of others were purchased in England.

The nomenclature has been checked against "Hortus" insofar as possible, the other names being those given by the English distributor.

Adiantum pedatum
" *capillus-veneris hybrid*
Asplenium trichomanes
Athyrium acrostichoides
" *angustifolium*
" *congestum*
" *ebeneum*
" *filix-femina*
" *filix-femina curtum*
" *filix-femina densum*
" *filix-femina decompositum dissectum*
" *filix-femina elworthii*
" *filix-femina michauxii*
" *filix-femina percristatum cousenii*
" *filix-femina plumosum*
" *filix-femina plumosum capitatum eleganii*
" *filix-femina plumosum divaricatum*
" *filix-femina pulcherrimum*
Blechnum spicant fosteri
" *spicant smithii*
" *spicant serratum*
Botrychium ternatum
" *virginianum*
Camptosorus rhizophyllus
Cheilanthes alabamensis
" *lanosa*
Cyrtomium rochfordianum
Cystopteris bulbifera
" *fragilis*
Dicksonia punctilobula
Dryopteris chrysoloba
" *cristata*
" *cristata clintoniana*
" *filix-mas*
" *filix-mas crispa barnesii*
" *filix-mas cristata martindale*
" *filix-mas grandiceps drueryi*

Dryopteris filix-mas polydactylon cousenii
" *goldiana*
" *hexagonoptera*
" *linnaeana*
" *marginalis*
" *noveboracensis*
" *opaca*
" *phegopteris*
" *pseudo-mas pinderii*
" *rigida*
" *spinulosa*
" *spinulosa dilatata*
" *spinulosa dilatata boydii*
" *thelypteris*
" *viridescens*
Lygodium palmatum
Onoclea sensibilis
Ophioglossum vulgatum
Osmunda cinnamomea
" *claytoniana*
" *regalis*
" *regalis gracilis*
Pellaea atropurpurea
Phyllitis scolopendrium
Phyllitis scolopendrium crispa
" *scolopendrium grandiceps*
Polypodium vulgare
Polystichum acrostichoides
" *braunii*
" *aculeatum*
" *aculeatum foliosum*
" *aculeatum lobatum*
" *aculeatum decompositum dissectum*
" *aculeatum divisilobum*
" *aculeatum divisilobum moly*
" *aculeatum grandi*
" *munitum*
" *plumosum densum*
Pteretis nodulosa
" *struthiopteris*
Pteris aquilina
Woodsia ilvensis
" *obtusa*
Woodwardia areolata
" *radicans*
" *virginica*

LAURA L. BARNES, *Barnes Foundation, Merion, Pa.*

Polypodium vulgare
Phegopteris polypodioides
hexagonoptera
Dryopteris
Adiantum pedatum
Pteris aquilina
Woodwardia virginica
areolata
Asplenium Trichomanes
platyneuron
acrostichoides
Filix-femina
Polystichum acrostichoides
Braunii
Aspidium Thelypteris
simulatum
noveboracense
marginale
Goldianum
cristatum
and *hybrids*
spinulosum,
var. *intermedium*
Boottii
Cystopteris bulbifera
fragilis
Woodsia ilvensis
obtusa
Dicksonia punctilobula
Onoclea sensibilis
Struthiopteris
Osmunda regalis
Claytoniana
cinnamomea
Botrychium obliquum
virginianum

FRANK H. SPRAGUE, *Wollaston, Mass.*

I started my fern garden in 1911. Previous to that year, however, I had a few specimens growing at scattered places in the yard. Most of the ferns were planted during 1911 and 1912, at any time from May to September, with practically no fatalities. My experiences with

this fern garden were printed in some detail in the American Fern Journal of 1917, nos. 3 and 4, and 1918, no. 1. For some years interesting hours were spent in taking notes on the time of growth in Spring, the time of fruiting, the color of the sporangia, the behavior of individual species in their new environment, evergreen tendencies, and other characteristics. New species were planted when found and a few were bought from nurseries.

Gradually my profession began to demand so much of my attention that there was less and less time to devote to my fern garden and very little could be done beyond keeping the garden free from weeds and other undesirable growth. Life in the fern garden then practically resolved itself into a record of the survival of species. And there were some unexpected results.

The ferns of low grounds, for example, took kindly to the soil of my fern garden, with only the ordinary amount of moisture, and the cinnamon fern, royal fern, and marsh fern are still thriving after more than 20 years. The bulb-bearing bladder fern, so delicate in appearance, became a veritable weed for a few years, then it suddenly began to dwindle in numbers as if disgusted with its forwardness. The sturdy marginal shield fern failed to survive as long as a number of other species. The ebony spleenwort, apparently a vigorous grower, lived only a few years. The red-stiped lady fern apparently is endowed with more vigor and greater longevity than the type and other varieties of this species. The boulder fern, of drier habitats, refused to adapt itself to the new locality to which I had transplanted it. Other observations might be noted, but I do not feel justified in taking up the space required.

The following is a list of ferns and allies, all of which

were growing in my fern garden at the same time but with greater or less periods of existence:

1. *Osmunda cinnamomea*
2. *Osmunda claytoniana*
3. *Osmunda regalis*
4. *Botrychium virginianum*
5. *Botrychium obliquum*
6. *Botrychium obliquum dissectum*
7. *Pteris aquilina*
8. *Pellea atropurpurea*
9. *Woodsia obtusa*
10. *Polystichum acrostichoides*
11. *Polystichum acrostichoides* var. *crispum*
12. *Polystichum acrostichoides* var. *incisum*
13. *Aspidium thelypteris*
14. *Aspidium noveboracense*
15. *Aspidium marginale*
16. *Aspidium goldieanum*
17. *Aspidium cristatum*
18. *Aspidium spinulosum*
19. *Aspidium spinulosum intermedium*
20. *Aspidium spinulosum dilatatum*
21. *Aspidium filix-mas*
22. *Asplenium trichomanes*
23. *Asplenium ebeneum*
24. *Athyrium fiilix-foemina*
25. *Athyrium filix-foemina*, red-stiped variety
26. *Athyrium filix-foemina*, variety with wider fronds
27. *Athyrium thelypteroides*
28. *Polypodium vulgare*
29. *Phegopteris hexagonoptera*
30. *Cystopteris bulbifera*
31. *Cystopteris fragilis*
32. *Dicksonia pilosiuscula*
33. *Adiantum pedatum*
34. *Camptosorus rhizophyllus*
35. *Onoclea sensibílis*
36. *Struthiopteris germanica*
37. *Scolopendrium vulgare*
38. *Ophioglossum vulgatum*
39. *Lycopodium obscurum*
40. *Lycopodium lucidulum*

Of these, only numbers 1, 2, 3, 7, 10, 13, 21, 25, 33, and 36 are at the present time in a flourishing or fairly good condition. A few fronds still appear of numbers 24, 30, and 35. All of the others have disappeared. Several

other species found in this locality were not planted in the fern garden.—C. L. GRUBER, *Kutztown, Pa.*

1 *Ophioglossum vulgatum*
2 *Botrychium obliquum*
3 " *dissectum*
4 " *ternatum* var. *intermedium*
5 *Botrychium matricariae*
6 " *lanceolatum*
7 " *virginianum*
8 *Adiantum pedatum*
9 *Onoclea sensibilis*
10 *Pteris aquilina*
11 *Pellaea atropurpurea*
12 " *brachyptera*
13 *Osmunda cinnamomea*
14 " " var. with red *rachis*
15 *Osmunda claytoniana*
16 " *regalis*
17 " " var. *gracilis*
18 *Athyrium filix-femina*, upland
19 " " " , lowland
20 " " " var. *rubellum*
21 *Athyrium thelypteroides*
22 " " var. *cristatum*
23 *Polypodium vulgare*
24 " " , California var. (unknown)
25 *Phegopteris polypodioides*
26 " *hexagonoptera*
27 " *dryopteris*
28 *Cystopteris fragilis*
29 " *bulbifera*
30 *Woodwardia virginica*
31 " *augustifolia*
32 *Woodwardia radicans*
33 *Cheilanthes tomentosa*
34 " *lanosa*
35 *Struthiopteris germanica*
36 *Camptosorus rhizophyllus*
37 *Scolopendrium vulgare*
38 *Lygodium palmatum*
39 *Lomaria spicant*
40 *Woodsia ilvenis*
41 " *obtusa*
42 " *cathcartiana*
43 *Polystichum acrostichoides*
44 " " var. *incisum*
45 *Polystichum Braunii*
46 " *lonchitis*
47 *Aspidium fragrans*
48 " *thelypteris*
49 " *noveboracense*
50 " *simulatum*
51 " *marginale*
52 " " x *cristatum*
53 " *cristatum*
54 " *spinulosum*
55 " " x *cristatum*
56 " *filix-mas*
57 " *nevadense*
58 " *Goldieanum*
59 " *cristatum Clintonianum*
60 *Asplenium trichomanes*
61 " *ebeneum*
62 " *augustifolium*
63 " *montanum*
64 *Pellaea andromedaefolia*
65 *Dicksonia punctilobula*

Seven more ferns from the West Coast yet unidentified.

M. R. SHARPE, *Uxbridge, Mass.*

When the FERN JOURNAL first made the request for a census of fern gardens, I was somewhat timid about "fern garden." With the advent of garden clubs and the prolific garden magazine, I have taken to calling the bit of ground behind my house the back yard. By no charitable locution could it be called a fern garden.

Yes, I have ferns in it, but in a sort of hotchpotch defying all laws of order and proportion. They grow where they survive. I did try a bit of excavating and elevating to suggest a touch of non-conformity. This disturbance of the soil was not very successful. I am hoping that in a few seasons nature will correct my error. She has a way of asserting her independence.

Below is the list. From thirty-five species there has been only one "casualty"—the walking fern (*Camptosorus rhizophyllus*).

Polypodium virginianum
Adiantum pedatum
Pellaea atropurpurea
Woodwardia virginica
" *areolata*
Asplenium trichomanes
" ***platyneuron***
Athyrium angustifolium
" *acrostichoides*
" *angustum*
Polystichum acrostichoides
" ***braunii***
Thelypteris palustris
" *simulata*
" *noveboracensis*
" ***hexagonoptera***
" *dryopteris*
Thelypteris marginalis
" *goldiana*
" *clintoniana*
" *spinulosa*
" *intermedia*
Cystopteris fragilis
Woodsia obtusa
Dennstaedtia punctilobula
Onoclea sensibilis
Pteretis nodulosa
Lygodium palmatum
Osmunda regalis
" *claytoniana*
" *cinnamomea*
Botrychium obliquum
" ***dissectum***
" *virginianum*

W. L. DIX, *Trenton, N. J.*

Shorter Notes

AMERICAN BRACKEN ON LIMESTONE.—Usually when the American bracken, *Pteridium latiusculum* (Desv.) Hieron., grows in limestone regions, its rootstocks are found to be imbedded in a layer of surface soil from which the lime has been leached and the reaction has become acid. Exceptions to this rule may occur, however, just as in the case of the European plant, discussed on page 49 in No. 2 of this JOURNAL. On the occasion of the June, 1934, trip of the Botanical Society of America to the Bruce peninsula, Ontario, Canada, the American bracken was found at numerous localities with its rootstocks in direct contact with the limestone rock which outcrops so extensively there. Tests with indicators showed the reaction of the adherent soil to range

from neutral to low subalkaline, active alkalinity zero to 10 (pH 7 to 8).—EDGAR T. WHERRY, *University of Pennsylvania.*

SHAKESPEARE ON FERN SEED.—I have just read in the AMERICAN FERN JOURNAL the interesting article on Folk-lore of ferns. Would it be of interest to add to those notes a reference by Shakespeare, King Henry IV, Act II?

Gadshill: "We steal as in a castle, cocksure; we have the receipt of fern-seed, we walk invisible."

Chamberlain: "Nay, I think rather you are more beholden to the night than to fern-seed, for your walking invisible."—ARTHUR HOMBERSLEY, *Port-of-Spain, Trinidad.*

TRIP TO SPARTA, N. J., JULY 15, 1934.—Five members of the American Fern Society took part in the trip of the Torrey Botanical Club to Sparta, announced in this JOURNAL, No. 2, p. 62. The region proved a most interesting one, and Professor Edwards was able to show us no less than 40 different ferns and fern allies within a radius of 2 miles from Sparta. The more notable included: *Ophioglossum vulgatum, Pteretis nodulosa* (Ostrich-fern), *Cystopteris bulbifera, Dryopteris goldiana, Dryopteris phegopteris, Dryopteris linnaeana* (Oak-fern), *Woodwardia virginica, Asplenium cryptolepis* (Wall-rue), × *Asplenium ebenoides,* and hybrids of *Dryopteris cristata* with several other species.—E. T. W.

ANNOUNCEMENT OF DECEMBER MEETING.—The American Association for Advancement of Science and affiliated societies meet this year in Pittsburgh, Pennsylvania, the last week in December. The American Fern Society will hold a meeting for the reading of papers on Satur-

day afternoon, December 29th. All members are invited to attend and to present papers, the titles of which should be sent to the Secretary as soon as possible so as to be included in the printed program. It is planned to give special attention to the ferns of the regions where such meetings are held, and accordingly this time there will be a symposium on the ferns of Pennsylvania and their distribution. Contributions to this symposium are expected from Edw. H. Graham, Dr. E. M. Gress, Dr. O. E. Jennings, Arthur N. Leeds, and Edgar T. Wherry, and it is hoped that others will also take part.

American Fern Society

The following letter from one of our oldest and most valued members brought gratification to the officers of the Society and, we hope, will be of interest to other members.

". . . . It is my usual practice to send my dues in December for the following year. This I did not do last year, for I had about concluded to close my membership, not that my *interest* in ferns is *less*, but California has made a law forbidding the collecting of ferns (and wild flowers and almost everything else) growing on public lands and roadsides, and on private ground unless you have the *written permission* of the owner, or unless you have a permit issued by the County Commission. This because the tourists would pull them by the roots and as soon as they wilted throw them away, and already some kinds that were plentiful are almost all gone. To those of us who only took what we used for our collections, gardens and to exchange with other fern-lovers, it is a hardship (for of course we *all* cannot have permits). . . . (I have been told that I would have no trouble get-

ting a permit, as I have collected for the Biltmore Herbarium, and others, but have not been able to collect lately.)

But I concluded I liked to read the FERN JOURNAL and received letters sometimes, so would not give it up. And being a member would give me a list of the addresses of the members, so I could write to them. There is only one member living near me, Mr. F. M. Cota. Several from other states have made pleasant calls and I have enjoyed my long membership. (If I remember rightly I joined in 1897).''—MISS LAURA F. KIMBALL, *National City, San Diego Co., California.*

I wonder if any of your members could send a few fronds of your American ferns with sori. I am trying my hand at raising ferns from spores, as I find the plants do not stand the carriage very well.—EWART G. SMITH, *147 High St., Christchurch, New Zealand.*

New members:—

Simpson, Robert, Boonton, New Jersey.
Sprague, Frank H., 146 Summer St., Boston, Mass.

Change of address:—

Ewan, Joseph, 3000 Life Sciences Building, University of California, Berkeley, California.

The thanks of the Society are due to Dr. H. D. House for generously contributing the illustration which appears as plate 5 in this number of the JOURNAL, and to the Brooklyn Botanic Garden for the loan of the block for plate 4.

THE SOCIETY'S FINANCES.—In view of the state in which the Society's finances were left by the late treasurer, as reported in the last number of the JOURNAL, it appears desirable that a brief statement of its present condition as to current funds should be made to the members. At the beginning of the year cash on hand amounted to $590.23, of which $500 had been borrowed. Receipts to date (Sept. 7) from all sources have amounted to $579.53, giving a total of $1169.75. Disbursements for all purposes, including payments of $114.25, principal and interest, on the loan, of all bills left unpaid by the late treasurer and of bills for the JOURNAL, have been $989.91. This leaves $179.84 on hand. With this and such small receipts as may confidently be expected during the remainder of the year, the Society will be able to pay for the two remaining issues of the JOURNAL and close the year with its books balanced, except for the loan. Arrangements for its continuance have been made.

It should be borne in mind that the loan covered only bills actually incurred last year; it did not cover the JOURNAL for Oct.–Dec., 1933, which was held back until it could be ascertained in what state Mr. Underwood had left the Society and not issued until March, 1934. It has therefore been necessary to pay for five issues of the JOURNAL out of this year's income. Next year, with only the normal four issues billed, the going will be much easier.

Meanwhile, members in arrears are again urged to pay their dues.

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American Fern Journal

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Published by the

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EDITORS

R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

VOL. 24 OCTOBER–DECEMBER, 1934 NO. 4

Fern Field Notes, 1934

EDGAR T. WHERRY[1]

ADIANTUM TRICHOLEPIS.—Early in the year a trip was taken to Texas, primarily to study Phloxes, under the guidance of Miss Eula Whitehouse, of the State University. On April 23rd the route led across Medina County, and in the valley of the Medina River below a large dam I noticed some moist limestone cliffs along a brook, and proceeded to spend a few minutes in fern-hunting. Several species well known in that region were present, notably *Anemia mexicana*, *Cheilanthes alabamensis*, and *Adiantum Capillus-veneris*. The last received scant attention until I noticed that associated with it there were two or three plants of another member of the genus, having more rounded and hairy pinnules. Although the locality lies east of the hundredth meridian, no such species was listed in Small's Flora of the Southeastern States, nor in any other work on eastern ferns at hand. On comparison with the specimens in the herbarium of the Academy of Natural Sciences of Philadelphia, it was finally found to be *Adiantum tricholepis* Fée.

This Mexican fern, characterized by Eaton[2] as "the rarest of the North American species of Maidenhair,"

[1] Contribution from the Botanical Laboratory and Morris Arboretum of the University of Pennsylvania. The field trips herein referred to were made possible by an award of funds from the Board of Graduate Education and Research.

[2] Ferns of North America 2: 104, pl. 59. 1880.

[Volume 24, No. 3 of the JOURNAL, pages 65–96, plates 4 and 5, was issued Sept. 19, 1934.]

had been collected by Bigelow of the Mexican Boundary Survey party "near the mouth of the Rio Pecos in western Texas," and subsequently by Ferriss according to Clute[3] at the same place. Apparently, however, it has never been found elsewhere in the United States. Enough material was taken to make one herbarium sheet for the Philadelphia Academy, and extra fronds have been sent to the Gray and National Herbaria.

Opportunity may here be taken to dispose of a supposed record of this species in California. Eaton (*loc. cit.*) stated that "A single specimen in the Herbarium at Kew is marked by Mr. Nuttall:—'*Adiantum *dilatatum*, Nutt., Monterey, Cal.' I cannot learn that anyone has found it in California since his time, nor does the specimen accord perfectly with the type of the species." (Hooker[4] had referred the specimen in question to *A. chilense* G. K. β *hirsutum*.) Nuttall's own specimen is in the herbarium of the Academy of Natural Sciences of Philadelphia, and represents what was subsequently validly published as *A. jordani* C. Mueller, a well-known Californian plant.

ASPLENIUM BRADLEYI.—As a rule this fern is so sparsely represented at any one station that the collecting of enough to fill out a herbarium sheet would mean annihilation of the colony. Accordingly, I have long looked forward to visiting the mountains of Gaston County, North Carolina, where it occurs in some abundance. On June 12th there was an opportunity to do so. Leaving highway No. 74 at the east edge of the town of Kings Mountain, I drove southward on No. 215, which crosses the mountain of that name at Stepps Gap. On a spur about half a mile north of the gap some west-facing cliffs were seen, at an altitude of 1000 to 1200 feet, and in their crevices numerous plants of this species

[3] Fern Bull. **12**: 44. 1904.

[4] Species Filicum **2**: 43. 1858.

were growing. The only other rock fern observed, *A. platyneuron*, was actually much scarcer here. The rock is a ferruginous sandstone, and the soil reaction, as in most other occurrences of *A. bradleyi*, is mediacid.

A few miles to the southeast, across the line in York County, South Carolina, a small mountain could be seen standing out from the piedmont plain, its name proving to be Henry Knob. The next day a visit was made to this, and a few plants of *Asplenium bradleyi* were found on the west-facing cliffs near its summit, also at 1000 to 1200 feet. This is apparently the second record of the species from the state, and the first of typical material, for that from the station near Hartsville, Darlington County, is so aberrant as to deserve varietal, if not specific, separation.

ASPLENIUM RESILIENS.—A still further extension of range can now be added to those reported last year.[5] On August 13th, accompanied by Mr. W. S. Lapp, I visited the limestone cliffs along the abandoned canal, about half a mile north of the highway bridge, $2\frac{3}{4}$ miles southwest of Sharpsburg, Washington County, Maryland. Several small colonies of this fern were soon discovered here, and interestingly enough it occurred near trees of *Thuja occidentalis*, a frequent associate further south. A new state can thus be added to the list for this fern, and its known eastern limit extended to longitude 77° 48′.

At numerous localities of this fern, from northwestern Florida to central Texas and to northern West Virginia, it has always been observed to occur on limestone. In western North Carolina it is also on that rock, but I have long been puzzled by its recorded occurrence at the Falls of the Yadkin, in Stanly County, toward the middle of this state, where no limestone is known to exist. While this locality has now been stripped of native vege-

[5] AMER. FERN JOURN. 23: 112. 1933.

tation by the construction of a large dam and power plant, a visit and examination of fragments showed the schistose rock there to contain appreciable amounts of calcium carbonate. The presence of a calcicolous fern is therefore not so remarkable after all, although one cannot help marveling at the ability of its spores to travel more than a hundred miles from the next nearest colony, and find a small isolated outcrop of calcareous schist.

OPHIOGLOSSUM ENGELMANNI.—While the wide-spread deficiency of rainfall made this an unfavorable year to look for a plant which needs moisture to stimulate its growth, three counties have been added to the Virginia list. First it was found by Professor A. B. Massey about two miles east of Blacksburg, in Montgomery County. Then in June Mr. Lewis E. Anderson, a graduate student at the University of Pennsylvania, joined me in a search for it in the northern part of the Shenandoah Valley. We extended its previously known range considerably to the east by finding it near a school 2 miles south-southwest of Nineveh, near the northeast corner of Warren County. Subsequently a few withering plants were found along Highway No. 11 just east of Cedar Bluff Creek or Rocky Run, 2 miles north of Indianrock, in Botetourt County. A summary of the occurrence of this species in Virginia is to be published in the new mimeographed journal, *Claytonia*.

PELLAEA GLABELLA.—On August 16th this often overlooked species was found on bare perpendicular limestone cliffs along the Potomac River 1 mile east of Shepherdstown, Jefferson County, West Virginia. The following day it was collected in a similar situation on the opposite side of the river, along the old canal half a mile above the highway bridge, $2\frac{3}{4}$ miles southwest of Sharpsburg, Washington County, Maryland. Definite stations are thus established in two states, in which only vague reports of this fern had previously been made.

WOODSIA SCOPULINA.—In the interest of simplicity the name *scopulina* is here applied to both eastern and western occurrences of this fern, leaving the question as to possible geographic segregation open. During the year visits have been paid to stations for it in Arkansas and in Ontario, a new one has been found in Virginia, and best of all, the colony on White Oak Mountain, Polk County, North Carolina, referred to last year as doubtful, has been rediscovered.

The occurrence on Magazine Mountain, Logan County, Arkansas, discovered by E. J. Palmer[6] ten years ago, was visited in April, under the guidance of Professor D. M. Moore of the University of Arkansas. Nothing was observed to add to the excellent account of the locality given by Palmer, but some habitat photographs were taken, one of which is reproduced herewith as Plate 6, figure 2.

A colony along the Cowpasture River in Alleghany County, Virginia, discovered by A. N. Leeds and reported in this journal[7] two years ago represented at that time its northernmost known Appalachian station. In June of the present year it was found on the east bank of the same river about 5 miles further north; as this is in Bath County, it should be referred to the nearest named place within that county, and recorded as 10 miles southwest of Millboro Springs. Professor A. B. Massey of Blacksburg, Virginia, advises me that he has found it also in Craig County in that state, this constituting the sixth known station there.

Many years ago this *Woodsia* was collected in Algonquin Park, Ontario, by Professor Frank Morris of Peterborough, and in August of the present year I had the privilege of visiting the locality under his guidance,

[6] AMER. FERN JOURN. 14: 39. 1924.
[7] AMER. FERN JOURN. 22: 84. 1932.

Fig. 1.

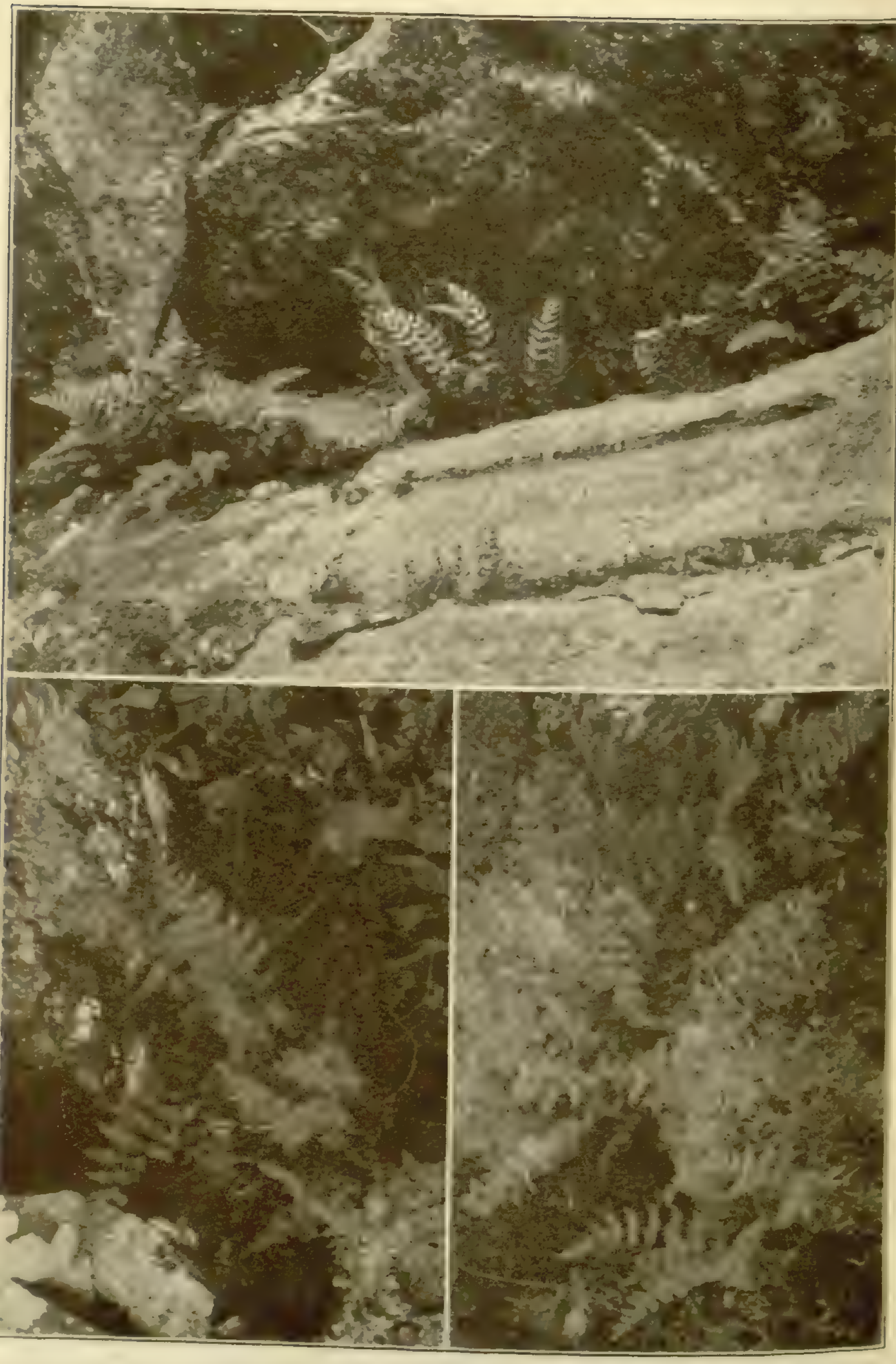

Fig. 2.

Fig. 3.

Eastern Colonies of Woodsia scopulina: 1, in Ontario; 2, in Arkansas; 3, in North Carolina.

accompanied by Dr. Horace G. Richards of Philadelphia, who is engaged in research work on Pleistocene problems. As has been pointed out by Professor M. L. Fernald,[8] the isolated stations of Cordilleran plants now known to exist in northeastern North America are frequently located in areas which appear to have escaped glaciation by the last (Wisconsin) ice sheet, and a study of the locality in question from this standpoint seemed desirable.

The fern was found to grow on a west-facing cliff of granite-gneiss about 50 feet up from the water-level of a small lake, tributary to Cache Lake. Scarcely fifteen living plants could be seen there, although there were remnants of a number of dead ones, indicating that the colony is dwindling if not dying out. Professor Morris stated that it was indeed much larger at the time he first discovered it, but that a diminution in summer rainfall, erosion of material from the cliff, and encroachment by the forest have all combined to reduce its size. Care was accordingly taken to collect only a limited number of fronds, a few from each clump, so that its shrinkage would not be accelerated. A photograph of this colony is here reproduced as Plate 6, fig. 1.

Unfortunately, no definite evidence bearing on the glacial history of the locality could be obtained. The slight extent of the weathering shown by the granite-gneiss outcrops and by the till which occurs at lower levels in the vicinity certainly suggested relatively recent glaciation. We were therefore inclined to favor the view that, as in the case of isolated stations for certain plants on Isle Royale, Lake Superior, the region was devegetated by Wisconsin ice, and the Woodsia has come in subsequently. However, more field work will be necessary before the matter can be regarded as settled.

Last year an unsuccessful attempt had been made to

[8] Mem. Amer. Acad. Arts Sci. **15**: 241. 1925.

rediscover the reported colony of *Woodsia scopulina* in the Craggy Mountains, so it was decided this year to look into its reputed occurrence on White Oak Mountain, in Polk County, North Carolina. On September 18th a party consisting of Messrs. J. E. Benedict, Jr., Frank M. Crayton, William A. Knight and myself drove up this mountain as far as the road would permit, and then walked out along the granite-gneiss ledges. On south-facing rocks we found only *Woodsia obtusa, Cheilanthes lanosa, C. tomentosa,* etc., but on those which faced northwest we soon came upon a number of plants of the fern we sought (see Plate 6, fig. 3). As its only known previous collection there had been that by E. C. Townsend in 1897, we had rediscovered a colony which represented the first find of this dominantly western fern in the eastern United States, but which had been lost to science for 37 years.

PHILADELPHIA, PA.

Adventures in Fern Collecting

ERNEST J. PALMER

Several years ago while collecting in western Texas I made my headquarters at the pretty and interesting little town of Uvalde, which lies in the Rio Grande plain just south of the Balconies escarpment that marks the boundary of the Edwards plateau. While there I was told of a rare and mysterious fern that was said to have been found in a cave near the postoffice of Montell. According to the story the fern which was unlike anything that had ever been seen before, had been discovered by a cowboy who had sold it to a wealthy lady in San Antonio for a substantial sum. I did not succeed in getting any clear description of the plant nor in locating a specimen of it, the purchase price apparently

having been the fact that had impressed my informant. Deciding from reports that Montell would be an interesting place for botanical exploration, I arranged a little later for transportation with the mail carrier, who also carried passengers and express between the railroad at Uvalde and the county-seat town of Rock Springs about eighty-five miles inland.

Montell is a way station in the hills of northern Uvalde County only about thirty-five miles from the railroad, but the roads over the steep rocky grades were bad and Fords of an earlier vintage were not as reliable vehicles for carrying heavy loads in 1917 as they are today. The trip, with three fellow passengers, all women, besides the driver and myself, and with the decrepit car and trailer loaded down with mail and baggage, proved to be something of an adventure in itself. We left the station at North Uvalde, or Sanson, about five p.m. and after many mishaps arrived minus the trailer at Montell in the gray dawn of the next morning. My clothes and collecting outfit were in the trailer and it was impossible to go far afield amongst the thorny shrubs and cacti that abounded on the rocky hills and that suggested ideal lurking places for rattlesnakes. So after breakfast I set out to see the town, which I found consisted of a small general store and two or three houses besides the "hotel," a dilapidated old building of two stories, minus paint and some window panes, and which was supported mainly by teamsters and truck drivers between Uvalde and Rock Springs.

The fern I was in search of seemed to be something of a *casus celeber* in the neighborhood, and everyone of whom I enquired knew something about it. An old lady to whom I was directed gave me a full account of its discovery including the name and history of the cowboy who had found it. The cave in which the fern grew was not more than seven or eight miles away but it was in

such an inaccessible place that it was not likely that any stranger could find it. However, she gave me the best directions she could and advised me to stop and make further inquiries at a house only two or three miles from the cave, and which had been the paternal home of the cowboy discoverer.

I set out early one afternoon to look for the place, collecting plants along the way. After leaving the main road I was in a wild country with only accommodation roads and trails that were not easy to follow. Enquiring of the first *caballero* whom I met I discovered that I had already gone several miles in the wrong direction, and by the time I had retraced my steps and found the house to which I had been directed the sun was getting low. The old gentleman who met me, and to whom I explained the object of my visit and as well as I could the scientific nature of my interest in the fern, offered me little encouragement. He pointed out a distant hill on which he said the cave was located, but looking me over with the usual attitude of the natives towards strangers and tenderfeet, he assured me that I could never find it without a guide. After going over the first ridge, he said, I would have to go through a cedar-brake in the valley, where I would surely get lost, and even if I succeeded in getting through that, the cave was hard to locate. Besides, it was infested with rattlesnakes, and the last time his boys had visited it they had narrowly escaped being bitten. "You'd better come back tomorrow," he said, "and maybe the boys can go with you."

How much of this was due to real anxiety for my safety and to the tenderfoot tradition and how much to the idea that the ferns had a commercial value and a wish to keep me from finding the place I could not tell, but as he added that some one had told them that the ferns in the cave might be "worth a thousand dollars,"

I suspect that the latter was largely the real motive. But finding myself so near the place and not knowing whether I would have a chance to return nor feeling much confidence that they would be willing to guide me to the place if I did, I was unwilling to give up the quest. So assuring him that I was pretty good at finding my way about and would like to try it at least, he gave me what proved to be as good direction as possible. After crossing the cedar-brake I was to look for a very dim trail that led to the top of the next hill, and the cave lay somewhere near the trail on the right side, just before reaching the top. I set out at a rapid stride and found no difficulty in crossing the cedar-brake and fortunately in finding what I took to be the trail. But there was nothing suggestive of caves, so far as I could see, on the low ledges and gentle slopes of the limestone hill. The sun was almost setting as I reached the top without having seen anything like a cave, and as I did not want to get caught in the dark in such a place I started back in disappointment ready to give up the search. Half way down the hill I noticed some bushes growing at a little distance from the trail, and going over to them I was delighted to see a wide opening or crevice in the surface of the limestone. There was no bluff or anything to mark the spot except the little clump of cactus and shrubs that really helped to conceal it. The opening was several feet long and just about wide enough for an ordinary sized man to enter. The sun was too low to shine directly into it, which it probably did for an hour or two each day, but the direction of the opening was such that some light penetrated and peering down I could see some plants growing on a ledge a few feet below. Thinking that I heard something move in the thorny bushes I threw a rock in and was answered by a significant buzz. However, I had no time for hunting snakes, and so after poking about with a

stout stick on the ledge below to make sure that none of them were lurking there, I let myself down almost my full length and was delighted to make out several clumps of a large and curious fern entirely unknown to me at the time. Hastily securing enough for several specimens of it, being careful not to take many of the roots nor to run the risk of exterminating it, I got out as quickly, with a feeling of relief and some exultation, and after putting them into my press, started in a run down the hill. Having taken my bearings carefully, I managed to get across the cedar-brake in the rapidly failing light and to find an old road which I followed out to the public highway. However, by that time it was quite dark and as I had come out at a different point from where I had entered, I was quite uncertain as to which way to go. I decided on the right and followed that direction for about half a mile when I decided that I must be going wrong, so I faced about and retraced my steps. The road was far from straight and there were no houses at which to inquire and I met no travelers, but my second guess proved correct and I arrived at the hotel between ten and eleven o'clock, tired and hungry but happy. I was the only guest, but they gave me my supper, to which I did ample justice.

The fern found in the cave proved to be *Tectaria heracleifolia* (Willd.) Underw., a rare species in the southwestern United States. It has been found also in southern Florida growing in limestone sinks, and it ranges to the southward through the West Indies and Mexico into Central and South America. Coulter in his Botany of Western Texas mentions (as *Aspidium trifoliatum*) a collection by Lindheimer, in the entrance of a limestone cave near New Braunfels, in 1878. It may have since been found at other localities in the state, but I have no record of it.

Tectaria heracleifolia is a curious and interesting

rather than a beautiful fern. The fronds are large and coarse, on the Montell specimens from three to six decimeters tall including the stipes. In outline the fronds are ovate or triangular, deeply cut by broad sinuses into several irregular segments which are six to ten centimeters long and two to four centimeters wide. There are usually one or two pairs of pinnae with often an odd one on one side. The terminal segment is the longest and it has a long acuminate tip. The primary veins are distinct and the large round sori are arranged in two rows between them. The pale brown stipes are scaly especially towards the base.

The specimens from Montell, Texas, referred to in these notes was collected June 22, 1917, under my number 12328, and specimens of it are now in the Gray Herbarium, herbarium of the Missouri Botanical Garden, and in other herbaria as well as in my own collection.

ARNOLD ARBORETUM

Growing Ferns Under Difficulties

FRANK H. SPRAGUE

Fortunate indeed is the fern lover who is blessed with ideal conditions for growing choice varieties. Many no doubt who are not so favored would gladly pursue the hobby could they be assured of reasonable success. To some of those, perchance, the writer's exploits may be of interest. About three years ago he conceived the idea of starting a fern garden. At first the natural obstacles in the way seemed insuperable. Try to visualize, if you will, a location within seven miles of the State House in Boston, on a steep, dry southwestern exposure, with high winds blowing up the valley during much of the growing season, and with poor soil and inadequate shade in

the bargain. Of course a few species which thrive under almost any conditions could be made to grow here; but how about the Woodwardias and other swamp ferns, to say nothing of the delicate rock ferns found on dripping ledges?

In the first place, a number of small trees and shrubs had to be set out to give additional shade. A liberal supply of rich soil was brought by automobile from the nearest available swamp. Quantities of slab and broken rock were transported from ledges a mile or two distant and used to terrace steeper portions of the hillside. Stone walls of various sizes and shapes were built. One of these, facing north in a shaded spot, was backed with a bank of earth in which were set boards slanting obliquely down against the back of the wall. The V-shaped space was then filled with loose stones through which water from the hose could find its way into the soil and trickle out of the crevices in the face of the wall. Here, in due season, were placed the Walking Fern (*Camptosorus rhizophyllus*), Purple Cliff-brake (*Pellaea atropurpurea*), Slender Cliff-brake (*Cryptogramma Stelleri*), Fragrant Shield Fern (*Thelypteris fragrans*), Smooth Woodsia (*Woodsia glabella*), Alpine Woodsia (*W. alpina*), Green Spleenwort (*Asplenium viride*), Wall-rue Spleenwort (*A. cryptolepis*) and Maidenhair Spleenwort (*A. Trichomanes*). Vines of Virginian Creeper (*Parthenocissus quinquefolia*) were planted in the bank at the rear and allowed to run over the top. Filled-in areas enclosed by other walls provided suitable places for Boott's Shield Fern (*Thelypteris Boottii*), Goldie's Fern (*T. Goldiana*), Long Beech Fern (*T. Phegopteris*) and Silvery Spleenwort (*Athyrium acrostichoides*). Among fragments of rock at the base of a semicircular wall nestled tufts of Blunt-lobed Woodsia (*Woodsia obtusa*); and around the top Ebony Spleen-

wort (*Asplenium platyneuron*) found a suitable location. In the shadiest spot of all were colonized Braun's Holly Fern (*Polystichum Braunii*), Broad Beech Fern (*Thelypteris hexagonoptera*), Oak Fern (*T. Dryopteris*) and Virginia Grape Fern (*Botrychium virginianum*). Dissected Grape Fern (*B. dissectum*), Ternate Grape Fern (*B. dissectum* f. *obliquum*), Leathery Grape Fern (*B. ternatum*) and Adder's Tongue Fern (*Ophioglossum vulgatum*) were assigned to more open spots. Spinulose Shield Fern (*Thelypteris spinulosa*), Intermediate Shield Fern (*T. spinulosa* var. *intermedia*), Spreading Shield Fern (*T. spinulosa* var. *americana*), Crested Shield Fern (*T. cristata*) and Clinton's Shield Fern (*T. cristata* var. *Clintoniana*), being less exacting than some of the others, were relegated to a fairly shady section on the sidehill. Narrow-leaved Spleenwort (*Athyrium angustifolium*) was given a choice location in the shade, along with Maiden-hair Fern (*Adiantum pedatum*). The rapidly spreading Hay-scented Fern (*Dennstaedtia punctilobula*) was used to cover a bare spot in partial shade. Common Brake (*Pteridium latiusculum*), having been previously established in the yard, needed no further attention. Climbing Fern (*Lygodium palmatum*) was transplanted in soil brought from its native thicket and in an environment as nearly like the original setting as possible. Slabs of Common Polypody (*Polypodium virginianum*) were transferred from their home in the woods to the surface of two small boulders unearthed during excavating operations; and around their base Marginal Shield Fern (*Thelypteris marginalis*) was set. Near the foot of the hill were placed Royal Fern (*Osmunda regalis*), Interrupted Fern (*O. Claytoniana*), Cinnamon Fern (*O. cinnamomea*) and Sensitive Fern (*Onoclea sensibilis*). Ostrich Fern (*Pteretis nodulosa*) was put in a shady spot under a

cherry tree. Marsh Shield Fern (*Thelypteris palustris*) and Dodge's Shield Fern (*T. simulata*) found shelter beneath the spreading branches of a small hemlock. Bulblet Cystopteris (*C. bulbifera*), Christmas Fern (*Polystichum acrostichoides*), New York Fern (*Thelypteris noveboracensis*) and Lady Fern (*Athyrium angustum*) had to be content with less select locations on the hillside.

The most serious problem of all was how to coax strictly swamp ferns to grow in such a comparatively arid region. The difficulty was overcome, however, by building a semi-circular wall on the steep side-hill and filling the enclosed space with rich earth. Into this basin the surface water from a driveway above was diverted, so that whenever it rained the ground became thoroughly soaked. In dry spells the necessary moisture was supplied by the hose. Across the front of the "bog" was set a board, notched at intervals at the top, to prevent washing and insure an even distribution of water during a downpour. To aid in keeping the ground damp, the surface was covered with sphagnum and cranberry vines. A natural environment was thus created for Narrow-leaved Chain-fern (*Woodwardia areolata*) and Virginia Chain-fern (*W. virginica*); and among them were interspersed plants of Cardinal-flower (*Lobelia cardinalis*), Pitcher-plant (*Sarracenia purpurea*), Turtle-head (*Chelone glabra*) and sundry other bog plants. The retaining wall was surrounded by a trellis on which vines of Virginian Creeper (*Parthenocissus quinquefolia*), Trumpet Honeysuckle (*Lonicera sempervirens*) and Common Virgin's-Bower (*Clematis virginiana*) were trained to give shade and protection from the wind. Among crevices in the outer face of the wall, shielded by the vines, was Brittle Cystopteris (*C. fragilis*); while in an exposed place at

the top clumps of Rusty Woodsia (*Woodsia ilvensis*) found conditions to their liking.

Thirty-nine of these forty-seven species (varieties not included) were found by the writer in person in a few localities in Massachusetts, New Hampshire and Vermont; also a single plant of Hitchcock's Grape Fern (*Botrychium simplex*). The other eight he was able to locate through the aid of kind friends. Forty-one grew in Massachusetts east of the Connecticut River (thirty-one of them within fifteen miles of Boston), two more in New Hampshire, and five more in Vermont.

For ground cover, where needed, Partridge-berry (*Mitchella repens*), Twin-flower (*Linnaea borealis*), Checker-berry (*Gaultheria procumbens*) and numerous other creeping vines were introduced. To add color and variety, a few attractive wild flowers were interspersed with the ferns. As a shield from the wind, hedges of Japanese Barberry were planted along the tops of some of the walls. Quantities of maple leaves were gathered from the roadside in autumn and packed away to decompose over winter. Ferns partial to calcareous soils were helped by the addition of a little air-slaked lime. It is hardly necessary to state that the garden hose was an invaluable ally in the enterprise. Locality markers for the different specimens were inserted in cylindrical glass phials, with corks sunk slightly below the tops and protected by a coating of thick rubber cement. When the cement was thoroughly dry, the phials were attached in an inverted position to stakes.

The financial outlay involved in the undertaking was practically negligible aside from the cost of gasoline; for nature furnished all necessary materials. Was it worth while? That depends on the point of view. Nature pays big dividends to those who cooperate, in one of the

most fascinating pastimes, with her spontaneous efforts to express the beautiful.

WOLLASTON, MASSACHUSETTS.

Recent Fern Literature

Dr. Small has for some years shown a particular interest in ferns; witness his several articles on the ferns of Florida which are deposited in the Fern Society Library. In the two articles here reviewed,[1] he has turned his attention to the New York City region, dealing first with the species of ferns and other pteridophytes native to the acreage of the New York Botanical Garden, and secondly with the wider "Torrey Club area" covering roughly all the region within one hundred miles of New York City.

Dr. Small's papers are much more thoroughgoing than mere citations of lists of forms and localities. In discussing those species of the New York Garden area, totaling 24, in some 400 acres, he also deals with the geological and ecological aspects of this region. He notes that the fern species of the Garden are all of wide geographic distribution.

In this paper he has an interesting comment on the palaeontology of the ferns of this general region. Only *Onoclea* of the present list has any claim to long geological lineage.

In the longer paper on "Ferns Within One Hundred Miles of New York City," Dr. Small thoroughly analyzes the general problems which present themselves for consideration. On a map of the region he indicates the

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[1] Small, John K. *Native Ferns in the New York Botanical Garden.* Jour. N. Y. Bot'l Garden **35**: 148–151. 1934. *Ferns Within One Hundred Miles of New York City.* Jour. N. Y. Bot'l Garden **35**: 197–207. 1934.

division of the total area into the five provinces which represent differentiated environmental conditions. These are:

A. Coastal Plain
B. Piedmont
C. New England
D. Appalachian Valley
E. Appalachian Plateaus

After describing these provinces in some detail, he takes up a discussion of the actual pteridophyte species under the classification of (1) Wood-ferns; (2) Swamp-ferns; (3) Bog-ferns; (4) Aquatic ferns; (6) Rock-ferns. It is interesting to note the varying requirements of some species. A few are definitely limited to a particular habitat, others may be fairly abundant outside of their preferred regions.

The paper then takes up the pteridophyte families in succession and presents some general aspects regarding these families.

Dr. Small, in conclusion, finds that "The failure of a complete fern survey is not pardonable in these days." He urges that this whole area be searched most painstakingly, particularly in its less inhabited parts.

Copies of these two papers have been presented by Dr. Small to the Fern Society Library, and are available for loan.—RALPH C. BENEDICT.

Prof. Featherly, of the Oklahoma State College, and Miss Still have published a brief manual of the ferns of Oklahoma. There are keys to families, genera and species; under each of the 41 species a brief description, statement of habitat and of detailed distribution in the state, and a figure are given. The keys seem practicable, though it may be doubted if "plants with creeping rootstocks" is a sufficient guide to the *Osmundaceae* and *Polypodiaceae*. The figures are of unequal merit, some helpful, some, like the very different-looking pictures of

the really very similar *Cheilanthes Wootoni* and *C. Fendleri*, positively misleading. In general, the little pamphlet serves well its purpose of providing a brief, non-technical and easily usable account of the ferns of Oklahoma and deserves a hearty welcome as the first of a series of botanical studies which we hope may run to many numbers, and as exemplifying one of the most useful lines of effort on the part of botanists at State colleges—the investigating and recording of the local flora.[8]

In the American Botanist **40**: 125 (1934) Edward D. Hutt records finding *Ophioglossum* in Lake Co., Indiana, in ground which had "long ago been excavated for sand." Low ridges alternated with shallow depressions; on the ridges, in the shade of small shrubs and among cranberry vines, the *Ophioglossum* was found in considerable numbers.

Mr. A. H. G. Alston (Journ. Bot. **72**: 223. 1934) has examined the types of Presl's species of *Selaginella* in the Haenke herbarium at Prague. In addition to the nomenclatorial results of his work, he publishes a convenient summary of Haenke's itinerary.

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[8] Featherly, H. I., and Clara E. Still. The ferns of Oklahoma. Okla. A. & M. College Bot. Studies 1 (Exp. Sta. Circ. 80). 24 pp., 41 figs. June, 1934.

Shorter Notes

CAN ANYONE READILY DISTINGUISH THE NORTHERN AND SOUTHERN LADY FERN SPECIES?—"Please tell me how to distinguish *Athyrium angustum* from *A. asplenioides* easily, promptly, confidently, and correctly, especially with imperfect material?"

When that question came to me from Dr. J. K. Small, I could only answer, "I don't know how." When I referred the question to others who had been giving the matter more extended attention, I received essentially the same answer. One wrote that while the spores are distinctive when fully mature, they may be confused when just short of maturity. Another informed me that while differences of the glandular condition were sometimes cited, he had found these impossible to apply to dried material and he had not been able to discover in fresh material any clear correlation between differences in glandular condition and general foliar characters.

The forms of lady fern which occur, often together, in the eastern United States have long presented a puzzling problem for the fern student. If extremes of form and size are taken, the differences seem to be greater than those which differentiate many pairs of accepted species. However, when the problem is followed more extensively, it does not seem possible to separate a wide suite of specimens into two classes. It seems to most of us impossible to answer Dr. Small's question in any satisfactory way.

This difficulty had long resulted in the general practice, in taxonomic works, of referring all these eastern specimens to a single species, *Athyrium Filix-femina* (L.) Roth. Then some years ago, Dr. Butters,* in the course of an intensive study, worked out a basis of dif-

* Butters, F. K. Taxonomic and geographic studies in North American Ferns. Rhodora 19: 169–216, pl. 123. S. 1917.

ferentiation in the species by which he separated the whole range of material into two species. First, he concluded that the eastern material is specifically distinct from true *Athyrium Filix-femina*, so that neither of the two eastern lady ferns should be called by that name. One, *A. angustum* (Willd.) Presl, is predominantly a more northern form. The other, *A. asplenioides* (Michx.) Desv., occupies the southern part of the range formerly ascribed to the whole species. Apparently, in their separate ranges, the two forms occur almost exclusively of each other, but where their ranges overlap, both types are present and the difficulties of separation present themselves.

Dr. Butters' study was a worth-while effort. His proposal to recognize two distinct species, together with his analysis of the differences in geographic distribution and the tendency toward correlated morphologic differences has constituted a valuable working hypothesis in centering attention of field and laboratory work on the problem involved. However, if, after the extended period which has elapsed since his proposals were published, and after the careful attempts which others have made to substantiate his findings, the question asked at the beginning of this dicussion cannot be answered satisfactorily, then it would seem proper to return to the older practice of recognizing one polymorphic species of eastern lady fern.

As a summary of the whole lady-fern problem, the question asked in the title of this note may be rephrased and an additional, more general question added:

1. Can two species of lady fern be satisfactorily distinguished in Eastern North America: respectively, *Athyrium angustum* and *A. asplenioides*?

2. Can the forms of lady fern of Eastern North America be adequately differentiated as a species distinct from true *Athyrium Filix-femina* of Europe?

The pages of the JOURNAL are open for answers.—R. C. BENEDICT.

SOME OBSERVATIONS ON OSMUNDAS.—I noticed a note on the red-stemmed cinnamon fern in vol. 24, no. 1, of the FERN JOURNAL, and a little later found this form myself. There was only one plant, about 18 inches high. It was growing in a damp, shady wood with the type. The pinnae are close together and the pinnules are more rounded than in the type. In this and other respects it resembles a hypothetical cross between *Osmunda cinnamomea* and *O. Claytoniana*. The stipes are wine-colored, very much the same color as in red-stemmed forms of lady-fern, up to or a little beyond the basal pinnae.

Along a clearing made for a road I found abnormal fronds of *O. cinnamomea* and *O. regalis*. The rootstocks were undoubtedly injured and, as the clearing was done in the spring, the new fronds were also probably either cut off or mutilated. New fronds have just fully unrolled; in many cases the *O. cinnamomea* is variety *incisa* and the *O. regalis* tends toward an analogous variety. The incised condition is particularly pronounced in the cinnamon fern; the royal is only slightly incised. This may help to explain how the incised varieties arise.

Both of these stations are in the Dunes.—R. M. TRYON, JR., Chicago, Ill.

ANOTHER FERN-GARDEN LIST.—I have noted the fern-garden lists in the last number of the AMERICAN FERN JOURNAL and the request that other members send in their lists. I am a newcomer in this field and therefore I am rather hesitant to send my list.

My ferns are, with one exception, limited to specimens I have gathered within a radius of fifty miles of Madison in my frequent trips. Due to the very limited room in my "postage stamp" garden, I have confined my planting to ferns indigenous in this locality. My experience with

the cinnamon fern, royal fern and marsh fern is the same as that of Mr. C. L. Gruber (p. 89 of the JOURNAL), that is, they took kindly to the soil of my garden without special preparation and the ordinary amount of moisture. The purple cliff-brake presents difficulties, for the birds insist on pulling it from the rock crevices because the thread-like roots are needed for their nests.

Nearly all of the ferns in the list are found in the vicinity of Devil's Lake.

1. *Botrychium virginianum*
2. *Adiantum pedatum*
3. *Athyrium acrostichoides*
4. " *Filix-femina*
5. *Camptosorus rhizophyllus*
6. *Cystopteris bulbifera*
7. *Dryopteris cristata*
8. " *marginalis*
9. " *Thelypteris*
10. " *spinulosa dilatata*
11. " " *intermedia*
12. *Onoclea sensibilis*
13. *Osmunda cinnamomea*
14. " *Claytoniana*
15. " *regalis*
16. *Pellaea atropurpurea*
17. *Phegopteris Dryopteris*
18. " *hexagonoptera*
19. " *polypodioides*
20. *Polypodium vulgare*
21. *Pteretis nodulosa*
22. *Woodsia ilvensis*
23. *Cystopteris fragilis*

O. W. STOREY, *Madison, Wisconsin*

American Fern Society

One of the most distinguished members of the Society, Dr. Nathaniel Lord Britton, for 33 years Director of the New York Botanical Garden, died at New York, June 25, 1934, in his 76th year. He had made for himself a

prominent place in American botany; no adequate account of a career so full of large accomplishment as his can be given here. He graduated from Columbia College in 1879 and his first botanical publication appeared in the same year. He was at once appointed assistant to Prof. Newberry at Columbia and became professor of Botany there in 1891. In 1896 he was chosen director of the newly founded New York Botanical Garden. The rapid development of that institution under his leadership; its many publications culminating in the "North American Flora"; his own studies of the plants of the West Indies; his part in the "Scientific Survey of Porto Rico and the Virgin Islands"; the monumental work on *Cactaceae* in which he collaborated with Dr. J. N. Rose, are well known to all botanists. He married Elizabeth Gertrude Knight, a botanist of distinction in her own right, in 1885; she died four months before him.

Mrs. Elizabeth Gertrude (Knight) Britton, wife of Dr. N. L. Britton of the New York Botanical Garden, and a member of this Society since 1911, died at New York Feb. 25, 1934. She was born in New York Jan. 9, 1858. Much of her childhood was spent on her grandfather's estate in Cuba. She graduated from Normal (now Hunter) College in New York in 1875 and served as teacher of science there until her marriage to Dr. Britton in 1885. She early developed an interest in botany and some time before her marriage had begun that study of mosses which she carried on throughout her life, becoming Honorary Curator of Mosses at the Garden. She had also more than a passing interest in ferns; it was she who discovered *Schizaea* in Nova Scotia and incited Mr. Waghorne to rediscover it in Newfoundland, and she published accounts of the life history of this fern and of the tropical *Vittaria lineata*. She was one of the organizers of the Wild Flower Preservation Society

in 1902 and for years was active and influential in its work. She was her husband's constant helper at the Garden and on many excursions to the West Indies.

Mrs. Elizabeth Braxton (Simpson) Davenport, a member of this Society since 1901, died at Brattleboro, Vermont, Aug. 28, 1934, aged 89. She was born in Philadelphia. Her mother was a Quaker, and she was educated in the schools of that sect, something, she once wrote "for which I can never be thankful enough." Visits to various institutions were part of the curriculum; those to the Academy of Science (where the skeletons seem to have impressed her most, but without horror), fostered an inborn love of natural history. "I never selected botany and bird study" she wrote, "they took possession of me as a very young child." In 1862 she married Alonzo C. Davenport, a merchant of Brattleboro, Vermont. There she had more opportunity than in Philadelphia for field studies. Ornithology was her primary interest. She has said that she was probably the first anywhere, certainly the first in Vermont, systematically to feed birds out-of-doors during the winter. She was one of the first national board of directors of the American Ornithologists' Union; her "most engrossing interest" became the work of the Audubon Societies for the protection of birds. In pursuit of it, she travelled much about Vermont, speaking in schools, and organizing local societies. She was one of the founders of the Vermont Bird Club and a member of many distinguished scientific associations.

Her interest in botany and especially in ferns was scarcely less than in birds. She was a friend of C. C. Frost, a correspondent of George E. Davenport and many other botanists, and one of the early and active members of the Vermont Botanical Club.

Mrs. Davenport had no taste for writing and published very little. About a year before her death, at the

request of one of the editors of this JOURNAL, she dictated some autobiographical notes. The brief extracts from them which follow will give as vivid an idea as, perhaps, anything can of the enthusiasm and thoroughness with which she went about her work and of the qualities which, added to an unusually attractive personality, made it a privilege to be with her in the field.

"I used to start before the first of May, with my pack, to meet the bird migration in different parts of the state. . . . I have been on the top of Mansfield in the spring before the snow had gone or the forest trees had leaved out. Sometimes I had a companion, but more often was obliged to go alone."

"I very soon formed the practice of settling in some favorable place in the mountains and, with my binoculars and my microscope, remain until fall, making trips where I could help and many for my own work, then spending the winter where I could be in touch with the Botanical Museum at the Bronx, the museums sometimes in Washington and sometimes farther south, and in Philadelphia while members of my family still lived."

And this is her modest summing up: "My life has been a very busy one; but years ago I realized how many people there were to do the large things, and so few interested in the small things, that I decided *that* should be my line of work."

November 2nd, 1934.

Mrs. Elsie Gibson Whitney
Secretary American Fern Society,
New York State Museum, Albany, N. Y.

Dear Mrs. Whitney,

There were 108 members of the American Fern Society who expressed their approval of the candidates selected by the Nominating Committee. All voters were in favor of electing our first president, Dr. Willard Nelson Clute, to honorary membership in the Society,

with the exception of four who very probably overlooked marking that part of their ballots. A number also added expressions of earnest approval of the Committee's recommendation in regard to Dr. Clute.

As judge of elections, I declare the following elected as officers of the Society for the year 1935:

President ..... Dr. Edgar T. Wherry
Vice-President ..... Mrs. Carlotta C. Hall
Secretary ..... Mrs. Elsie G. Whitney
Treasurer ..... Dr. Henry K. Svenson

To *Honorary Membership*: Dr. Willard Nelson Clute.

Respectfully submitted,

HARRY W. TRUDELL, *Judge of Elections.*

The editors have received a complaint from one member that two exchanges, initiated by him through notices in the JOURNAL, have proved unsatisfactory in that he has received poor, scrappy and badly prepared specimens in return for good ones and, at least in one case, has been unable to get even an answer to a protest.

It has been our custom to print in the JOURNAL any proposal for exchange received from a member in good standing. That is one of the purposes of the JOURNAL; we have felt, and still feel, that the results are far more likely to be good than bad. We are sure that they have been good in the vast majority of cases. But we cannot guarantee that they will always be.

What we can, and will, do is this. We will place on file the complaint received and any other information, favorable or otherwise, that comes to us. Any member intending to start an exchange because of a notice in the JOURNAL may write to any of the editors; we will give him whatever information we can as to the desirability of a given exchange.

The JOURNAL is indebted to Dr. Wherry for the illustration which accompanies his article in this number.

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ERRATA

Page 18, line 2 from bottom, for Styermark, read Steyermark.
Page 27, line 4, for *Crystopteris*, read *Cystopteris*.
Page 87, line 24, for *Athyrium congestum*, read *Asplenium congestum*.
Page 87, line 25, for *Athyrium ebeneum*, read *Asplenium ebeneum*.

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Published by the

AMERICAN FERN SOCIETY

EDITORS

R. C. BENEDICT
W. R. MAXON
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American Fern Journal

VOL. 25 JANUARY–MARCH, 1935 No. 1

Additional Fern Records from Missouri

ERNEST J. PALMER and JULIAN A. STEYERMARK

In the summer of 1933 the writers spent about three weeks botanizing in Missouri, collecting in twenty-eight counties in different parts of the state, and in the season of 1934 the junior author made an extended botanical survey of the state visiting many other counties. Ferns were found in nearly all of the localities explored, and as a result of the two expeditions, while no new species were added to the known fern flora of the state, at least two records of considerable interest were made and many others that add valuable data as to the distribution of ferns in the state. As the published records for the state are still very incomplete, a list of the new records from counties not mentioned in our previous paper on the "Ferns and Fern Allies of Missouri"[1] or in Miss Pinkerton's paper under the same title,[2] will be found here.

The new records established in 1933 are designated on the list by an asterisk (*). All others are based upon collections by the junior author in 1934. Specimens of all of the collections have been deposited in the herbarium of the Missouri Botanical Garden and duplicates of many of them will be found in the Gray Herbarium and in other collections.

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[1] AM. FERN JOUR. **22**: 105–122. 1932.

[2] Ann. Mo. Bot. Gard. **20**: 45–78. 1933.

[Volume 24, No. 4 of the JOURNAL, pages 97–128, plate 6, was issued January 20, 1935.]

Perhaps the most interesting discovery to be reported is that of a second station in the state for the Ostrich Fern (*Pteretis nodulosa*). This northern fern barely reaches the borders of the state and is one of the rarest species, having previously been known only from a single collection made many years ago by B. F. Bush, near Livonia, Putnam County.

While in northern Missouri in 1933 we went to Livonia partly for the purpose of trying to locate Bush's station, but after a careful search, and after having followed several clues based on inquiries amongst people living in the vicinity, we were unsuccessful in finding it. Livonia is located near the Chariton River, which here forms the boundary between Putnam and Schuyler counties. On the west side is a wide alluvial bottom, and on the opposite, or Schuyler County, side are well-developed woody bluffs with a rich flora. The surface of the uplands is covered with glacial drift, and the bluffs or steep banks of the river are of clay, gravel and sandy loam, enriched with humus where the grade is not too steep. *Botrychium virginianum*, *Onoclea sensibilis*, *Athyrium angustum* var. *rubellum* and *Osmunda Claytoniana* were collected here. A farmer from whom we enquired told us of a locality a few miles away where tall ferns were growing abundantly in a deep sandy ravine, and we hoped this might prove to be a colony of the species we were especially looking for. The following day we investigated it, but found only the same species of *Onoclea*, *Athyrium* and *Osmunda* that we had collected along the bluffs. The Interrupted Fern was growing luxuriantly and in abundance in the fine moist sand that was exposed on the steep sides of the ravine. An interesting feature of this fern, which is near the southwestern limits of its range in eastern Missouri, is that it seldom produces spore-bearing pinnae. Only

sterile specimens were found along the bluffs of the Chariton, and on the specimens collected in the sandy ravines only two fronds were found with any trace of fertile segments, and on one of these there was only a single fertile pinna. This was also the case at the other localities in northern Missouri where we found it growing.

A few days later we stopped to explore the bluff of a little stream in the northwest corner of Mercer County, near Saline, and only two or three miles south of the Iowa state line. The flora along the steep north-facing bank or bluff here proved to be rich and interesting. A colony of the Ostrich Fern was growing near the foot of the bluff in a spot kept wet for most of the year by seepage water. There were no fertile fronds at the time of our visit, but the stiff upright habit of the plant, with the pinnae reduced towards the base of the fronds, the deeply channelled stipes and the rootstock of this fern are unmistakable.

The discovery, or rediscovery, of the little Cloak Fern (*Notholaena dealbata*) in St. Louis County in 1934 is also interesting, as this station is the most eastern one known in the United States. Miss Pinkerton shows this species on her distribution chart of Missouri ferns as occurring in St. Louis and St. Charles counties, but as based upon reports only, with no specimens seen. So there was some doubt as to the correctness of the previous report. This species is a calciphile and it is found on limestone and dolomite bluffs mostly in the western part of the state, although Miss Pinkerton shows records from Franklin and Boone counties.[3] The St. Louis

[3] The reporting of this species hitherto from Boone County is an error; it should be Howard Co. instead. We are indebted for this information to Dr. Francis Drouet of the Department of Botany, University of Missouri.

County station is near the Jefferson County line and on dry cliffs of Kimswick limestone.

POLYPODIUM VIRGINIANUM L. Douglas and Perry counties.

POLYPODIUM POLYPODIOIDES (L.) Watt. Douglas, Howell, Ozark, *Ripley and *Shannon counties.

NOTHOLAENA DEALBATA (Pursh) Kunze. St. Louis County.

ADIANTUM PEDATUM L. *Adair, Andrew, Buchanan, Calloway, Cooper, Dallas, *Dekalb, Douglas, Franklin, Gasconade, Gentry, Grundy, *Harrison, Hickory, Howard, *Knox, Laclede, Macon, *Mercer, Montgomery, Morgan, *Oregon, Osage, Perry, Pettis, *Phelps, Platte, Polk, St. Charles, *Schuyler, *Shelby, *Sullivan, Warren and Wright counties.

ADIANTUM CAPILLUS-VENERIS L. Douglas and Dallas counties.

PTERIDIUM LATIUSCULUM (Desv.) Hier. var. PSEUDOCAUDATUM (Clute) Maxon. Bollinger, Dallas and Reynolds counties.

CHEILANTHES FEEI Moore. Cedar, Dent, Douglas, Henry, Hickory, Montgomery, *Oregon, *Phelps and Polk counties.

CHEILANTHES LANOSA (Michx.) Watt. Cedar, Douglas, Gasconade and Oregon counties.

PELLAEA ATROPURPUREA (L.) Link. Dallas, Hickory, *Monroe, *Phelps, Polk and *Ripley counties.

PELLAEA GLABELLA Mett. Cedar, Dallas, Dent, Douglas, Hickory, Howell, Miller, Montgomery, Oregon, Polk, Ripley and Texas counties.

ASPLENIUM PLATYNEURON (L.) Oakes. Bollinger, Cedar, Dallas, Douglas, Hickory, Moniteau, Morgan, Perry and *Putnam counties.

ASPLENIUM RESILIENS Kunze. Dallas, Dent, Henry, Howell, *Oregon, *Phelps, Reynolds and Texas counties.

ASPLENIUM TRICHOMANES L. Perry and Polk counties.

ASPLENIUM CRYPTOLEPIS Fernald. Dent and Texas counties.

ATHYRIUM ANGUSTUM (Willd.) Presl var. RUBELLUM (Gilbert) Butters. *Adair, *Harrison, *Knox, *Mercer, *Schuyler, *Scotland, *Shelby and *Sullivan counties.

ATHYRIUM ASPLENIOIDES (Michx.) Desv. Bollinger, Crawford, Perry and Texas counties.

ATHYRIUM ACROSTICHOIDES (Sw.) Diels. Texas County.

ATHYRIUM ANGUSTIFOLIUM (Michx.) Milde. Howell, Morgan and Perry counties.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. Dallas, Hickory, Maries, Miller and Morgan counties.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. *Adair, *Audrain, *Monroe, *Oregon, *Shelby and *Sullivan counties.

THELYPTERIS HEXAGONOPTERA (L.) Weatherby. Bollinger and *Oregon counties.

THELYPTERIS MARGINALIS (L.) Nieuwland. Crawford, Douglas, Perry and *Shannon counties.

CYSTOPTERIS FRAGILIS (L.) Bernh. *Adair, *Audrain, *Dekalb, *Harrison, *Mercer, *Monroe, *Schuyler, *Shelby and *Sullivan counties.

CYSTOPTERIS BULBIFERA (L.) Bernh. Dallas, Hickory, *Monroe, Morgan, *Oregon, Polk, Reynolds and *Shelby counties.

WOODSIA OBTUSA (Spreng.) Torr. *Adair, *Shannon, *Shelby and *Vernon counties.

ONOCLEA SENSIBILIS L. *Adair, *Harrison, *Knox, *Schuyler, *Scotland, *Shelby and *Sullivan counties.

PTERETIS NODULOSA (Michx.) Nieuwland. *Mercer County.

OSMUNDA REGALIS L. var. SPECTABILIS (Willd.) Gray. Bollinger and Texas counties.

OSMUNDA CLAYTONIANA L. *Schuyler and *Sullivan counties.

OPHIOGLOSSUM ENGELMANNI Prantl. Dent, Henry and Montgomery counties.

BOTRYCHIUM VIRGINIANUM L. *Adair, *Audrain, *Harrison, *Mercer, *Monroe, *Schuyler, *Shelby and *Sullivan counties.

EQUISETUM ARVENSE L. *Audrain, *Dekalb, *Harrison, *Mercer, *Monroe, *Scotland and *Schuyler counties.

EQUISETUM LAEVIGATUM A. Br. *Clark, *Oregon and *Shelby counties.

EQUISETUM HYEMALE L. var. ROBUSTUM (A. Br.) A. A. Eaton. Adair County.

SELAGINELLA RUPESTRIS (L.) Spring. Gasconade County.

SELAGINELLA APODA (L.) Fernald. Douglas, Laclede and Texas counties.

ARNOLD ARBORETUM
MISSOURI BOTANICAL GARDEN

Random Observations on Equisetum*

JOHN H. SCHAFFNER

In his studies on the genus Equisetum, the writer has made many incidental observations of various characteristics of these unique plants, which, although they are of no great importance, may nevertheless help in creating a greater interest than has heretofore been bestowed on them by nature lovers and enthusiasts.

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*Papers from the Department of Botany, The Ohio State University, No. 351.

GROWING EQUISETA IN THE GREENHOUSE

Some species of Equisetum make a very fine growth when planted in large flower pots in the greenhouse. The pots should be placed in crocks kept partly filled with water so that abundant moisture is available to the plants at all times. The soil mixture should have some sand, and a thin layer of acid peat on the surface is also desirable. Most species of Equisetum grown in the greenhouse are especially subject to the attacks of mealy-bugs but otherwise they usually remain free from fungus and insect pests.

The following species have been grown successfully in recent years: *E. hiemale* L., *E. scirpoides* Mx., *E. variegatum* Schleich., *E. trachyodon* A. Br., *E. praealtum* Raf., *E. telmateia* Ehrh., *E. arvense* L., *E. laevigatum* A. Br., and *E. kansanum* Schaffn. Other species no doubt would do equally well and there is no reason why these remnants of a great ancient phylum of the plant kingdom should not be much more generally exhibited in greenhouses and conservatories than they are. Why should one not be able to see a growing plant of *E. giganteum* L. in a conservatory as readily as one can see a restored dinosaur in a museum?

CULTIVATING EQUISETUM IN THE GARDEN

A patch of low ground with running water from a drain pipe in the Ohio State University Botanic Garden was available for the beginnings of an "Equisetetum" and some plantings have been made during the past four years as material became available. At present (1934) the following species are making a successful growth: *E. hiemale, E. praealtum, E. laevigatum, E. kansanum, E. trachyodon, E. variegatum, E. fluviatile, E. pratense* Ehrh., *E. telmateia,* and *E. arvense.* The water drain provided sufficient moisture and the surface of the

ground was sprinkled with acid peat, which seems to have a beneficial effect on all the species. *E. variegatum* and *E. trachyodon* maintained distinctive characters although growing in the same habitat with similar environmental conditions. *E. silvaticum* L. and *E. scirpoides* were also planted but did not survive, probably because at first the soil was not properly prepared. It is hoped that many fern gardeners will attempt to add an "Equisetetum" to their ferneries.

RESISTANCE OF SEVERAL SPECIES TO COLD

The winter of 1933–34 was unusually severe at Columbus, Ohio, and thus afforded an opportunity to compare the hardiness of several species of Equisetum growing in essentially the same environment in close proximity in the botanic garden. *E. hiemale* from California came through the winter in the best condition, having suffered but little from the severe cold. *E. trachyodon* and *E. variegatum* also passed the winter with little injury. *E. laevigatum* had its tops killed but the lower half or two-thirds of most of the aerial shoots survived. *E. praealtum* was killed down nearly to the ground, although it is usually much more resistant to winter conditions than *E. laevigatum*. *E. kansanum*, which has annual aerial shoots under normal winter conditions, had all of its green shoots dead down to the ground before Christmas. It is to be remembered that the evergreen species of Equisetum endure cold much better in moist situations than in dry ones. The garden habitat of the species mentioned above was moderately wet most of the winter.

APPEARANCE OF NEW SHOOTS IN SPRING

Equisetum pratense was the first to sprout new shoots. On April 15, sterile shoots were 4 inches high and had distinct whorls of buds, the incepts of future branches.

No other species showed signs of growth at this time. On April 20, *E. fluviatile* began to appear and on April 25, *E. kansanum* and *E. arvense* were peeping out of the ground. On sunny exposed banks about Columbus, fertile shoots were coming into bloom at this time and the sterile shoots were farther advanced than those in the garden. By April 28, *E. laevigatum* and *E. trachyodon* began to sprout new shoots and by May 4, both *E. praealtum* and *E. hiemale* had developed a few shoots from one to two inches above ground. At the same time *E. variegatum* showed signs of new growth. On May 5, *E. telmateia* was making its first appearance and several days later many vigorous shoots of this species were appearing, some as far as 14 feet from the original point of planting in 1932. The rhizomes had made a very rapid growth through the rich moist soil. This is at the average rate of 7 feet a year, but the greater part of the growth was in 1933, apparently, since only a small potted plant was transferred to the garden in the spring of 1932. In a well established plant the rate of growth of the rhizome must be considerably more than 7 feet a season. This rate of growth compares favorably with some of the rapid-growing flowering plants. All of the dates given of the first appearance of new shoots in the spring are a considerable number of days later than they would be following a milder winter and spring.

TIME OF BLOOMING OF TWO SPECIES

Since the plants in the garden were in essentially the same ecological conditions, an opportunity was also given of comparing the time of blooming of two closely related species which have rather definite and short periods of annual cone development. The two species were *E. kansanum*, and *E. laevigatum*. Usually *E. laevigatum* has the longest blooming period. In 1933,

E. kansanum began shedding spores on May 22. The cones of *E. laevigatum* at this time were still quite immature and did not begin to shed spores until May 31. In 1934, probably due to the cold winter and spring, the production of cones was considerably delayed as compared with the previous season. Cones began to appear on the *E. kansanum* shoots on May 12 and by May 16 were developing rapidly. At this time *E. laevigatum,* but a few feet away, was not showing any indication of cone development. On June 2, *E. kansanum* began to shed spores and it was in full bloom by June 5. *E. laevigatum* showed the first cones breaking through the basal sheaths on June 1 and began to shed spores on June 17. Apparently, *E. kansanum* is, under the same environment, from one to two weeks earlier than *E. laevigatum.* A visit on June 3, 1934, to Clark Co., where both species were obtained originally for the garden, showed a more advanced condition of the plants. *E. kansanum* was shedding spores abundantly and apparently began about May 31, three days earlier than the garden plants at Columbus. *E. laevigatum* also had the cones more advanced, a few of the earlier ones appeared ready to begin to shed spores in a few days, although for the most part the cones were still very young, some just beginning to break through the subtending sheaths.

In general, *E. laevigatum* is a taller and more robust species than *E. kansanum* and the garden plants also showed this difference. The tallest *E. laevigatum* measured 40 inches while the tallest *E. kansanum* measured only 31 inches. On the average, there was about 8 inches difference between the height of the two species. Of course, in Equisetums quite generally, environment has a decided effect on the height of the plant, so species can only be compared in this respect when growing in the same habitats in the same locality.

COILED TIPS

In the early spring of 1934, those having charge of the public works program in Columbus decided to "improve" Indian Springs ravine, my favorite local Equisetum study ground, where *E. praealtum* grows in great abundance. Acres of the plants were mowed down and the "hay" thrown into ditches. In the meantime the whole season was very dry. However, the plants made a good recovery and there would be just as much work required next spring to continue the "improved" condition. The present autumn it was observed that a very large number of shoots had slender coiled tips, while heretofore coiling was quite rare in this patch. Just what the efficient factor was that caused this frequent coiling would be difficult to determine, but there must have been something in the weather or in the mowing that induced an unusual number of shoots to coil. The writer observed a somewhat similar condition in the Pecos River valley in New Mexico the past summer in relation to *E. kansanum*. A little meadow which was mown from time to time had an abundance of this species, many shoots with slender coiling tips. The coiled tip may be regarded as another sporadic or intermittent hereditary factor in Equisetum as it occurs frequently in *E. fluviatile*, *E. kansanum*, and *E. praealtum* as well as in some other species.

COLUMBUS, OHIO

Recent Fern Literature

The editors have recently received a number of reprints, most generously sent by Dr. Christensen. One deals with the ferns of Mt. Kinabalu, in Borneo. The flora of this region has been explored by some six or seven English and Dutch collectors and three Americans —Mr. Topping, a member of the Fern Society, and Mr. and Mrs. Clemens. The results of all the expeditions, so far as ferns are concerned, have been brought together by Dr. Christensen and Mr. Holttum of Singapore in a fully and critically annotated list of species.[2]

In two brief papers Dr. Christensen and M. Tardieu-Blot describe several new ferns from Indo-china.[3]

Both Chinese and Japanese botanists in recent years have been active in the taxonomic study of their floras; many publications have appeared and are appearing; and ferns have attracted their due share of attention. Sometimes there has been duplication of effort. At the same time that Drs. Christensen and Ching were working on a treatment of the ferns of a portion of Kwangsi Province, three Chinese botanists published an independent article on the ferns of the region. The results arrived at were so far different as to cause Christensen and Ching to publish their own conclusions in a series of critical notes on the earlier work.[4]

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[2] Christensen, C., and R. E. Holttum. The Ferns of Mt. Kinabalu. Gardens Bull. 7: 191–324, pls. 51–62. June 1, 1934.

[3] Christensen, C. Filices novae Indochinenses. Bull. Mus. Paris, ser. 2, 6: 100–106. 1934. Christensen and Tardieu-Blot. Deux Aspléniées nouvelles d'Indochine. Bull. Mus. Paris, ser. 2, 6: 107–109. 1934.

[4] Christensen, C., and R. C. Ching. Annotationes et Corrigenda ad Wu, Wong et Pong: Polypodiaceae Yaoshanensis, Kwangsi. Bull. Dept. Biol. Sun Yatsen Univ. no. 6. May, 1933.

Some years ago, Dr. Christensen published a catalogue of the ferns of Madagascar. This is now succeeded by a real fern flora of the island. With some assistance from Iversen (*Isoetes*), Alston (*Selaginella*) and the veteran collector, Perrier de la Bathie, Dr. Christensen has produced a thorough and detailed manual, done with all the advantage of his learning and trained skill. It has lists of collectors who have worked on the island, keys to species, an abundance of critical comment well worth perusal by any serious student of ferns, and numerous illustrations drawn by the author himself. A discussion of geographic relationships brings out the fact that there are striking similarities between the fern floras of Madagascar and tropical America. Forty-four species, 17.8% of the whole, are of American relationship; three are known outside of America only in the Mascarene region. The curious little genus *Trachypteris* has two species in South America, one in Madagascar and none elsewhere.[5]

The classification of ferns has been worked out more slowly than that of most vascular plants; some parts of it appear to be still in a state of flux, accentuated by recent phylogenetic activity. This is particularly true of the large group which we have known as the genus *Polypodium*. Bower, in his great work on the phyletic arrangement of the ferns, excluded it almost entirely, feeling that it was not yet well enough known for positive treatment. Somewhat similarly, Christensen, though long convinced that Dryopteris could be divided into several natural genera, has never actually set up these genera, preferring to await the results of a thorough study of all the species.

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[5] Christensen, C. The Pteridophyta of Madagascar. Dansk Bot. Arkiv, 7: I–XX, 1–254, pls. 1–80. 1932.

Perhaps it is to be regretted that like caution has not everywhere been exercised; perhaps by trial and error and argument we arrive most quickly at the truth. In any case, the phylogenetic attack has resulted in a number of segregations from the old Polypodium and no little disagreement as to what segregates should be made and what their limits should be. In the tenth installment of his Studies of Chinese Ferns, Dr. Ching, following Copeland, takes up *Microsporium* Link, with *Polypodium punctatum* as type and a total of some 40 species, most of them needing new combinations. On his own account, he revives the almost forgotten *Colysis* Presl, with *Polypodium ellipticum* as type and about 25 species, also mostly requiring new combinations. For the rest of the paper, he is occupied in putting back into *Leptochilus* species removed from it by Copeland.

In the final portion of this installment of the "studies," Christensen and Ching describe a most interesting new genus, *Sinopteris*. In appearance its two species are similar to *Cheilanthes argentea*, but the sori consist of only a single sporangium each, and this is very large, without the slender stalk usually characteristic of the *Polypodiaceae* and with a globose body and a very broad, almost complete ring of upwards of 30 cells, as against a maximum of 22 in most of the family. The venation is also peculiar. The authors regard this remarkable fern as a primitive form representing the prototype of the group of *Cheilanthes argentea*. It inhabits northern and western China.[6]

It may be recalled that a few recent writers on American ferns have hesitated to follow Christensen in plac-

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[6] The Studies of Chinese Ferns, X. Bull. Fan Mem. Inst. Biol. 4: 293–364. May 10, 1933.

ing the oak and beech ferns in *Dryopteris* § *Lastrea* and have retained for them the genus *Phegopteris* of the older books. They now find some support from Dr. Ching, who, though he leaves the beech ferns in *Lastrea* (which he prefers to regard as a genus), places the two oak ferns and three related Asiatic and Philippine species in a genus of their own, characterized principally by creeping rootstock with scattered fronds borne singly on it, and deltoid lamina with rachis bent over at an angle to the stipe and with the lower pinnae jointed to it. For this genus he takes up the name *Gymnocarpium* Newman (1851).

Dr. Ching has difficulty with this name. The very similar name *Gymnocarpum* had already been used. Moreover, Newman included in his genus beside *Polypodium Dryopteris* and *P. Robertianum, P. Phegopteris* and "about thirty exotic species." His description is so vague that, as Dr. Ching says, the name could, from it alone, be applied to any fern with running rootstock, divided leaves, free veins and naked sori. He feels, however, that "according to the Rules of International Nomenclature, it is quite legal that by the previous removal by Bory of *Polypodium Phegopteris* L. into his genus *Lastrea, Gymnocarpium* Newman . . . should remain as valid name for the residual species. . . ." Even if it be allowed that the doctrine of residues can be applied to a genus before the genus exists, this will not do. Bory "removed" into his genus *Lastrea* not only *P. Phegopteris*, but also *P. Dryopteris* and *P. Robertianum* (Dict. Class. Nat. Hist. **9**: 233. 1926). If his action determines the status of *Gymnocarpium*, it becomes a direct synonym of *Lastrea*.

However, it is possible to arrive at a right conclusion by a wrong route. As the first to take up again the name *Gymnocarpium*, Dr. Ching has the privilege of

designating a type for it—even though the much later *Curriania* Copeland, based on one of the oriental species, is a clearer name to which there is no objection other than the chronological.

Dr. Ching states that the most extraordinary feature of his genus is "the prominently articulated insertion at the apex of the slender stipe of the gently sloping lamina" and expresses surprise that no one but Mettenius should have noticed it. This phrasing gives the impression that the whole lamina is articulated to the stipe; but such (at least in the oak fern) is not actually the case. Stipe and rachis are continuous; but the lowest pinnae and often the second pair also, are articulated to the rachis. Others beside Mettenius have noticed and correctly described this feature—for instance, Luerssen (in Rabenhorst, Kryptogamenflora Deutschlands, Oesterr. Schweiz, ed. 2, **3**: 302. 1889) and D. C. Eaton (Ferns No. Amer. **1**: 159. 1878). But unlike Dr. Ching, they did not regard the character as of any particular significance.

It may be questioned, and is questioned by more conservative taxonomists, whether anything is gained by treating such groups as that here considered as genera rather than subgenera or sections. But in any case, Dr. Ching seems to have defined a natural assemblage of species and by so much to have added to the clarity and completeness of our classification.[7]

Marjorie Stearns writes pleasantly in *Horticulture* (**12**: 288. 1934) of native ferns in the garden—pleasantly, but we fear with no great familiarity with the subjects of her discourse. We are told that *Botrychium*

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[7] Ching, R. C. On the nomenclature and systematic position of Polypodium Dryopteris L. and related species. Contr. Biol. Lab. Sci. Soc. China. Bot. 9: 30–43, fig. . 1933.

obliquum is cut similarly to *B. dissectum* and *B. virginianum*, but differs in the form of the fruit; and that *Woodsia ilvensis* and *W. obtusa* have a brownish sheen on the fronds "due to the myriad of fine brown hairs that cover them"; and that any of nine species, including the at least mildly calciphile walking fern and such usually difficult subjects as adder's-tongue and maidenhair spleenwort will do well indoors with wild flowers that demand acid soil conditions.

Shorter Notes

I have gone over my collection of ferns from the Mammoth Cave Region of Kentucky with Mr. A. N. Leeds of the Philadelphia Academy of Natural Sciences and have found that I was mistaken in my classification of one of the species as *Woodsia scopulina*. In my article which appeared in Vol. 23, No. 4, of the FERN JOURNAL I mentioned this species as one of those found in the Mammoth Cave Region. I should like that error to be corrected by the publication of this note in the JOURNAL and ask that its readers excuse this mistake of a beginner.—WM. B. YOUMANS, *Bowling Green, Ky.*

FILMY-FERN NATIVE IN OHIO.—Recently Mr. Charles R. Goslin, of Lancaster, discovered the Filmy-fern, *Trichomanes boschianum* Sturm, at the lower end of Spruce Run, Hocking Co. The species has hitherto not been known to occur north of Kentucky, and this record is apparently "farthest north" for the Hymenophyllaceae in the eastern U. S. The southeastern region of Ohio is a part of the unglaciated area of the Allegheny Plateau and contains many southern plants in isolated

habitats, probably survivals of a past period when climatic conditions were more favorable for southern species. This area forms a large triangle in the state, extending from Adams Co. north to Licking and Monroe counties. The habitat for the filmy-fern is not very far from the place in Athens Co. where the climbing-fern was found two years ago.—JOHN H. SCHAFFNER, *Columbus, Ohio.*

A NEW FORM OF THE WALKING FERN.—The writer has recently received material of an unusual form of the walking fern (*Camptosorus rhizophyllus* (L.) Link. The plants were found by Mr. Guy Boyce, of Proctor, Vermont. In all, six plants were found, all growing clustered together in the soil at the base of a limestone rock.

The variation of this form from the species can be determined at a glance by reference to the accompanying illustration. The basal auricles are more prominent, and are strongly lobed; in some fronds the lobes are cleft almost to the mid-rib, so that the frond is pinnatifid at base. The margins of the frond are dissected into irregular, obtuse teeth, with clefts 1–3 mm. deep.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link, forma **Boycei** f. nov., habitus plantae formaque frondium generalis speciei similis; auriculae lateribus penitus sinuosis, ambitus frondis inaequaliter serratus, dentibus obtusis, 1–3 mm. longis.

Habit of plant and general shape of fronds like the species; auricles deeply lobed, margin of frond irregularly dissected, teeth obtuse, 1–3 mm. long.—Highgate Springs, Vermont, August 14, 1934. Type in Gray Herbarium.—C. L. WILSON, *Dartmouth College.*

ADDITIONAL FERTILE PINNULES IN THE RATTLESNAKE FERN.—An example of abnormal spore production in the

Camptosorus rhizophyllus, forma Boycei.
Drawn from the type specimen.

rattlesnake fern, *Botrychium virginianum* (L.) Sw., has been found in the Herbarium of Northwestern University. The lowest pinnule on the two basal pinnae of the normally sterile portion bears apparently normal spores. These two fertile pinnules are shown near the petiole in the accompanying photograph. They are comparable in every way to the divisions of the fertile spike, and further emphasize the commonly accepted notion that the fertile spike is a specialized portion of a foliage leaf. The presence of additional spore-bearing segments on this, the most specialized species of the genus, is thought to be unusual although it has often been observed in other species, as *B. lunaria* and *B. obliquum.* The significance of variations in spore production in this and other genera of ferns has been discussed by Chrysler[1] in an article to which the reader may refer for additional references on this subject.—E. S. FORD, *Evanston, Ill.*

American Fern Society

Report of the President for 1934

Thanks to the cooperation of our board of officers and editors, to the response of our membership, most of whom have kept their dues paid up in spite of the depression, and to the generosity of a member who wishes to remain anonymous, in lending us sufficient funds to pay outstanding printers' bills, the American Fern Society is on its feet again. As will be shown in the accompanying reports from the Secretary and Treasurer, our membership has not fallen off appreciably, and our finances are in such shape that we can look forward to

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[1] Chrysler, M. A., Abnormalities of Botrychium and Certain Other Ferns. Bull. Torrey Bot. Club **53**: 279–288. 1926.

Additional Fertile Pinnules in *Botrychium virginianum* (at the bases of the lowest pinnae).

having all our indebtedness paid off by the end of next year. In the interest of economy no current list of members was published this year, but it is hoped that one may be issued during 1935.

Our herbarium has been steadily growing, but a considerable amount of material has remained unmounted. Recently Curator Hopkins had an opportunity to avail himself of emergency help, paid from state and government funds, and making use of some privately donated mounting paper, is having our specimens put into good shape. Loans have been made to several members for use in the preparation of articles on various ferns.

In view of the financial situation, it was deemed advisable to reduce the size of the JOURNAL slightly, and limit the number of illustrations. Nevertheless we have been able to publish practically all manuscript received, comprising fifteen leading articles, about the same number of shorter notes, and numerous reviews, obituary notices, and items concerning the activities of the Society.

Respectfully submitted,
EDGAR T. WHERRY, *President.*

Report of the Secretary for 1934

The year 1934 has seen a continuation of the usual activities of the Society on a somewhat enlarged scale. Due in part to the status of the Society's finances, and in part to what seems an abnormal rate of loss of members owing to the economic situation throughout the country, special efforts have been made to reach and draw into our membership as many as possible of the ever increasing number of people who are interested in ferns.

Four general or regional meetings have been held during the year: In the middle of April, about thirty-five

members and their friends gathered for an interesting day at the Brooklyn Botanic Garden. In August a similar group met at the Berkshire Museum at Pittsfield, Mass., and after an interesting illustrated talk on the ferns and associated plants of the region in the morning, spent the afternoon in the field with much pleasure and profit.

The regular Field Meeting of the Society was held over the Labor Day week-end at Lancaster, Pennsylvania. The final meeting was at the Pittsburgh Meeting of the American Association for the Advancement of Science. These two meetings are fully reported elsewhere in this number of the JOURNAL.

These gatherings have been helpful in interesting new members,—in all thirty-seven have been added during the year. We have lost during the same time five members through death, and sixteen have resigned. Throughout the year there has been an average of about three hundred and fifty on the membership list. This includes, however, a few names of those who through oversight or for other reasons have neglected to send in the annual dues for the previous year.

The annual election returned the same officers for another year, and elected to honorary membership Professor Willard N. Clute, the Society's founder and first President.

Respectfully submitted,
ELSIE G. WHITNEY, *Secretary*.

Report of the Treasurer for 1934

The Society has passed through a difficult year due to the "freezing" of invested and reserve funds, a situation which has been discussed in a recent number of the FERN JOURNAL, and it seems improbable that anything will be realized on these funds in the near future. Through the generosity of a member, who wishes to remain anonymous, the sum of five hundred dollars was loaned to the Society at the beginning of 1934 in order to pay the printer's bills which had accumulated. The amount ($871.96), shown in the accompanying report as paid to the Science Press Printing Company during 1934, compared with the estimated budget of $375 for the FERN JOURNAL of the same year, will give some idea of the obstacles which had to be overcome. The staunch support of the members of the Fern Society during this crisis is shown by the fact that only $70.29 of the 1933 and 1934 dues remain unpaid, and it is reasonably certain that a substantial part of this sum will be received during 1935. Only now and then does the treasurer have opportunity to write a personal note to members, but he wishes to sincerely thank all who have by their cooperation made a successful year out of a situation that appeared last spring to have its gloomy moments. The cash on hand (December 31, 1934) is $167.89,* not counting $12.40 in the closed bank. It is expected that the sum of $200.00 will be applied toward the loan during 1935. Another year should see us out of financial difficulties, and it is hoped that such rigid economy will not be required in the publication of the FERN JOURNAL. In 1935, the treasurer's expense (which for 1934 has included new stationery for the Society, billheads, envel-

* The bank balance in the Irving Trust Co., Flatbush Branch, Brooklyn, N. Y., Feb. 27, 1935, after payment of $100.00 (Feb. 26, 1935) towards the loan, amounts to $340.03.

opes and a set of books) should be materially decreased. One of the most encouraging items is the sale of back numbers of the FERN JOURNAL which in 1934 amounted to $76.35, and it appears that the large stock of back numbers now safely stored at the Brooklyn Botanic Garden is perhaps the Society's best asset. As shown by the appended report, the number of members remains substantially the same, due to the fact that the new members coming into the Society have balanced those who have withdrawn.

HENRY K. SVENSON,
Treasurer.

RECEIPTS AND DISBURSEMENTS
Jan. 1, 1934, to Dec. 31, 1934

Cash on hand, Jan. 1, 1934		$590.23
Cash in closed bank		12.40

Receipts

Membership dues received 1934	$421.11	
" " " 1935	16.50	
Subscriptions 1934	100.73	
" 1935	27.50	
Advertising	4.00	
Gifts	10.25	
Sale of back numbers	76.35	
Reprints	23.07	
		679.51
		$1,282.14

Disbursements

Expenses, Secretary	$ 8.50	
" Treasurer	51.99	
Payment on note (principal)	100.00	
Interest on note	14.25	
Agency commissions	8.97	
R. A. Ware (Investigation Committee)	10.26	
Science Press Printing Company	871.96	
C. S. Lewis	19.00	
Bank charges	.60	
Membership announcements	15.00	
R. C. Benedict (express charges)	.75	
Trade discount (H. G. Fiedler)	.57	
		1,101.85
		$ 180.29

Treasurer's Expenses

Stationery—		
Letterheads	$10.50	
Billheads	6.50	
Envelopes	4.50	
		$ 21.50
One double entry bookkeeping set	3.65	
Postage stamps	19.59	
Luncheon, Society Meeting (April 14, 1934)	7.25	
		$ 51.99

ESTIMATED BUDGET FOR 1935

Membership dues (305)		$457.50
Subscriptions (100)		125.00
Sale of back numbers		50.00
Delinquencies		10.00
Cash on hand Dec. 31, 1935	$167.89	
Less payment for Vol. 24, No. 4 (Sept.–Dec. 1934)	87.54	
		80.35
		$722.85

Outgo

AMERICAN FERN JOURNAL	$400.00	
Secretary's expenses	20.00	
Treasurer's expenses	25.00	
Reduction of note	200.00	
Ballots	5.25	
		650.25
Estimated balance		$ 72.60

Annual Members—Dec. 31, 1934 Total 305

37 of the 305 Annual Members began in 1934

12 Annual Members resigned during 1934
7 " " died " 1934
} not included in the 305

44 have not paid for 1934

Subscribers—Dec. 31, 1934

"	Individual	27
"	Institutions, U. S.	63
"	Foreign	14
		Total 104

16 of the 27 subscriptions began in 1934

9 of the 27 have not paid for 1934

2 of the 63 Institution Subscribers began in 1934
9 of the 63 Institution Subscribers have not paid for 1934
2 foreign subscriptions are free exchange
7 have not paid for 1934
No new foreign subscribers during 1934.

Dr. Edgar T. Wherry, President:

On Jan. 31st, 1935, Mr. W. L. Highton and I examined the books of the American Fern Society and checked the statement of the financial condition of the Society on Dec. 31, 1934, prepared by the Treasurer. We found that the accounts had been completely and accurately kept and that the statement mentioned was a correct statement of the financial condition of the Society.

JAMES L. EDWARDS,
Chairman, Auditing Committee.

THE LANCASTER MEETING.—The field meeting of the American Fern Society, held in Lancaster, Pennsylvania, September 1st, 2nd and 3rd, 1934, was a thoroughly enjoyable and profitable occasion to the 27 enthusiastic persons attending. A number of trips to interesting fern localities in the vicinity of Lancaster were arranged by Mrs. Charles Y. Tanger, the Misses Groff and Sener, Mr. W. H. Auxer and other Lancaster naturalists.

On Saturday afternoon, an excursion was made to an old lime kiln, a few miles southwest of Lancaster; this had been unused for some forty years, and was thickly covered, both inside and out, with a heavy growth of *Pellaea atropurpurea*. In the same neighborhood the party was shown a number of plants of *Asplenium ebenoides*, and some very luxuriant *Camptosorus rhizophyllus*. We also visited a limestone cliff south of the city on which grows *Asplenium Ruta-muraria* (now called *A. cryptolepis*), here very rare. After dinner the group were invited, through the kindness of Prof.

H. J. Roddy, to Franklin and Marshall College, where on the walls of the lecture room in Science Hall had been arranged a splendidly mounted and well selected series of local ferns. Of special interest was a large assortment of *Polystichum acrostichoides*, showing in a wide variety many curious forms.

Sunday morning was spent in beautiful Tucquan Ravine, the home of many fern species among which are included the rare aspleniums of this district. We were glad to see that the colonies of *Asplenium Bradleyi* showed some improvement this year over several previous seasons. A single tiny plant of an interesting hybrid, apparently *Asplenium Bradleyi* × *montanum*, was also examined, and Mr. Leonard Harner called attention to an *A. montanum* with the fronds forked into as many as three divisions.

After luncheon the party were driven to Colemanville and Marticville to see the hybrids *Dryopteris cristata* × *marginalis*, *D. marginalis* × *spinulosa*, and *D. Boottii;* and an occurrence of *Botrychium angustisegmentum* at the southern limit of its range. Near Martic Forge, in a pine-larch plantation, on the densely needle-covered ground, were some unusually symmetrical clumps of *Asplenium platyneuron*, *Dryopteris spinulosa*, *D. cristata* and *D. clintoniana*, a rather surprising habitat for the last two mentioned species. Sunday evening in the drawing room of the hotel, Lancaster members displayed treasured specimens of local ferns which were much admired and praised. Also, Mr. St. John exhibited a collection of Florida ferns containing many of the rarer species found in that state.

On Monday morning the region about Lake Grubb was explored, this being notable for its Lycopodiums and luxuriant Christmas Ferns, some interesting freaks of the latter being seen. In the afternoon a station for

Pellaea glabella was inspected, which was quite a treat for some of the members.

Much satisfaction was expressed by those attending the meeting and every one seemed to have experienced a most pleasant and interesting time. Forty-eight species of ferns and lycopodiums were listed as having been seen on the trips, growing under natural conditions. Credit is due Mrs. Tanger and her associates for the success of the occasion and to Dr. Wherry for his tireless guidance and advice.—HARRY W. TRUDELL.

THE PITTSBURGH MEETING.—In accordance with the announcement, the American Fern Society held a meeting in affiliation with the American Association for the Advancement of Science, on Saturday, December 29, 1934, from 2 to 4 P. M. Dr. Edward H. Graham and Dr. O. E. Jennings had prepared a mimeographed list of the ferns of the western half of the State, as represented in published reports and for the most part by specimens in the Carnegie Museum herbarium. Copies of this list were distributed to those in attendance, and Dr. Graham discussed the species included, giving interesting notes on their distribution and abundance in the region. Next Dr. E. M. Gress mentioned a number of recent notable finds of ferns in the State, exhibiting a fine series of sheets from the State Herbarium. Dr. Edgar T. Wherry then showed forty lantern slides representing some of the rarer species of Pennsylvania, including maps on which the distribution of each was shown in green, bringing out their geographic relations. Finally Mr. Arthur N. Leeds spoke on the Climbing Fern, (*Lygodium palmatum*), referring to early mentions of it in the journal of William Bartram, and reporting on his recent visit to one of Bartram's localities near Fayetteville, North Carolina, where it is still to be found.

The attendance at the meeting numbered about 40, more than half being non-members of the Society. Those coming from the greatest distances were Dr. T. C. Frye, from the State University at Seattle, Washington, author of a recent book on the ferns of the northwestern United States, and Dr. Frederic K. Butters from the University of Minnesota, Minneapolis, well known to members of this Society for his critical studies of our eastern *Athyriums*, *Botrychiums*, and *Pellaeas*. It is to be hoped that meetings of this sort, in which the ferns of the region about the meeting place are specially discussed, will be held frequently. The A. A. A. S. is to meet in June, 1935, in Minneapolis, and in December, 1935, at St. Louis, and members in those centers may well get together and make plans for gatherings of American Fern Society members at these times.—E. T. W.

All of us should be interested in the following letter from the founder of the Society:

NOVEMBER 20, 1934

Dear Doctor Wherry,

Your letter informing me that I have been elected to Honorary Membership in the American Fern Society, has been received.

Let me say that I very greatly appreciate this honor. Having spent many years in a region that could boast only five different kinds of ferns, and these among the commonest, my fern activities suffered something of an eclipse, but I have always followed the fortunes of the Fern Society with much interest. It is a source of much pleasure to me to know that my year-long efforts to get enough fern enthusiasts together to provide officers for a Fern "Chapter" more than forty years ago, has resulted in so important a society and given pleasure to so many.

Probably few members can now recall the early history of the Society or are aware that it is somewhat older

than commonly supposed. It was originally the Linnaean Fern Chapter of the Agassiz Association dating from 1893. For a time it circulated the reports of members to others through the mails and only later published such observations in that prothallium stage of the Fern Bulletin known as the *Linnaean Fern Bulletin*. But this is not early enough. Chapter 728 of the Agassiz Association, by which number it was known so long as it held membership in the Association, existed several years earlier as a local Chapter for the study of flowering plants as well as ferns.

Yours sincerely,
WILLARD N. CLUTE.

This bit of news of a once active member and former vice-president of the Society is also of interest:

"... You will be interested to learn, I am sure, that yesterday ... I called on ... Dr. E. L. Lee at his home in Bridgeport, Alabama. He will be 96 years old in January, 1935. ... He gave us some interesting information and allowed us to look over his (what seemed to me) very fine collection of ferns. He is a bit feeble and was exceedingly quiet for the most part, but once became rather aroused. That was when we suggested that there was a theory that the Hart's Tongue had been planted in Tennessee. He feels that it could not have been."

New members:

Burrows, Edwin J., Great Barrington, Mass.
Canan, Miss Elsie D., 836 Napoleon St., Johnstown, Pa.
Coe, J. E., 2024 Sunnyside Ave., Chicago, Ill.
Darbaker, Prof. L. K., 424 Franklin Ave., Wilkinsburg, Pa.
Dean, John Henry, Shawnee Wood, Knoxville, Tenn.
Hermann, F. J., Botanical Gardens, University of Michigan, Ann Arbor, Mich.
Maclaren, Miss Sallie S., South Egremont, Mass.
McGilliard, Eleanor, Dept. Botany, University of Chattanooga, Chattanooga, Tenn.

McVaugh, Rogers, Kinderhook, N. Y.
Meninger, Karl A., 1626 Plass St., Topeka, Kans.
Miller, Mrs. Lawrence Kelton, 42 Brunswick St., Pittsfield, Mass.
Park, Mrs. Franklin A., 812 Park Ave., New York City.
Scully, Dr. Francis J., 804 Medical Arts Building, Hot Springs, Ark.
Shelar, Prof. Keller, State Teachers College, Slippery Rock, Pa.
Soxman, G. M., 718 Haines Ave., Dallas, Texas.
Spahr, Mrs. Albert H., Fairbrook Farm, North Egremont, Mass.
Steere, William C., Dept. Botany, University of Michigan, Ann Arbor, Mich.
Wright, Mrs. C. H. C., 9 Lowell St., Cambridge, Mass.

Changes of address:

Boyce, Mrs. D. C., 4214 Bigelow Blvd., Pittsburgh, Pa.
Carlson, Mrs. T. O., 196 Pinehurst Ave., New York City.
Greene, F. C., Geological Survey, Box 138, Rolla, Mo.
Hall, Mrs. Carlotta C., 345 Forest Ave., Palo Alto, Cal.
Lombard, Dr. Robert H., 28 Indian Hill Road, Worcester, Mass.
Wilcox, Prof. Alice W., 750 No. Cliest Ave., Pasadena, Cal.
Wilson, Leonard R., Dept. of Geology, Coe College, Cedar Rapids, Iowa.
Zieman, J. Elting, 605 Watchung Road, Bound Brook, New Jersey.

A limited number of young hart's-tongue plants will be distributed from the Brooklyn Botanic Garden about June first. Applications should be accompanied by 25¢ for postage, packing, etc.

The JOURNAL is indebted to Mrs. C. A. Weatherby for the illustration of *Camptosorus rhizophyllus*, forma *Boycei*.

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Vol. 25 April-June, 1935 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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A regular loan department is maintained in connection with the Society herbarium. Members may borrow specimens from it at any time, the borrower paying all postal or express charges. The pages of the Journal are also open to members who wish to arrange exchanges; a membership list is published to further assist those interested in obtaining specimens from different localities.

American Fern Journal

VOL. 25 APRIL–JUNE, 1935 No. 2

Fern Study in Central Florida

EDWARD P. and ROBERT P. ST. JOHN

When the senior partner in the undertaking here reported spent his first winter in Florida he had a field acquaintance with about sixty ferns of the northeastern states. His somewhat dormant interest in fern study revived with the prospect of acquaintance with unfamiliar species, and he journeyed southward with visions of woodlands filled with ferns of varied form and size, growing in tropical luxuriance. After a few weeks in central Florida he was thoroughly disillusioned. Dry, grassy pinewoods in which no fern but the bracken could exist, and shallow lakes that were marshes half the year occupied more than three-fourths of the region. Flat, sandy "hammocks," as the forests of broad-leaved trees are called, and cypress swamps in which the height of the water level varies from three to five feet each year covered much of the remaining area, and offered no encouragement for fern study.

In due time, however, the chance remark of a neighbor led to a visit to one of the Pineola grottos, which were but a few miles distant. Here, in a limited area, a very different terrain was encountered. Broken and solid masses of limestone, eroded by water into buttresses, arches, columns, caves, and various strange forms, were shaded by towering forest trees that rose from tannic ooze. The surface of the rocks was honey-

[Volume 25, No. 1 of the JOURNAL, pages 1–32, plates 1 and 2, was issued April 20, 1935.]

combed; and from every pocket and ledge grew ferns, needle palms, and luxuriant tropical vines that climbed into the sky like Jack's bean stalk. Large ferns stood about the borders; and over the rocks in the greatest abundance grew creeping ferns, maidenhair, and lacy aspleniums. There was now no lag in the observer's interest.

Communication with Dr. John K. Small of The New York Botanical Garden led to acquaintance with his *Ferns of Florida*. Discovering, now, that he was living in a region rich in ferns, and one that had never been thoroughly explored by botanists, he determined upon a careful survey of the fern flora of the section. In the course of time he was joined in the study by his brother who revived an interest in botany from his college days and has since shared in the labors, discoveries, and satisfactions of the project.

The work that they have followed together has been wholly in the nature of first-hand investigation, for they have not been so fortunate as to have any fern student guide them to a station for any fern of this section save in case of one variety of a familiar species, and no books that were used indicated locations more definite than the county in which a species had been found. As the investigators had previously seen only eight of the fern species of the region, they found it necessary to gain a field acquaintance with fifty-four species that were new to them. Necessarily the first year's work was chiefly with problems of identification and distribution, but some ecological studies were undertaken and others were planned.

The special field which they are attempting to cover includes three counties: Citrus, Sumter, and Hernando. It covers about 1,600 square miles of territory, about one-thirty-fifth of the area of the state. It is in the

western part of the northern half of the peninsula. The geographical center of the state lies within it. It includes a large part of the "lime sink region"; on the west it borders the Gulf of Mexico, and at the east includes a narrow strip of the "lake region." The elevation above sea level of the larger part of the area is less than 100 feet; two or three notable hills may approach 300 feet. Except in the swamps the soil is almost en-

IN PINEOLA GROTTO

tirely sand, but in parts of Hernando County clay lies just below the surface, or rarely is exposed. The rock, which appears in occasional outcropping ledges, in sinks and grottos, and in boulders on the surface, is Ocala limestone, Tampa limestone, or Hawthorn phosphatic limestone. The drainage is mostly underground, either through the sand to rock cavities, or directly into sinks, which are crater-like depressions that connect with sub-

terranean passages. These caves open finally at lower levels near the Gulf coast as great springs from which issue full-grown rivers. The grottos are apparently places where the underground drainage system is now exposed above water level, and the endless passages and caverns leading through and under the fantastic rock formations are laid bare to view. In the northern half of the region of the study brooks and ordinary springs are entirely absent.

This "lime sink region" has long been considered notable because of the presence, on and about the rocks, of tropical ferns not found elsewhere in the state except in the extreme southern part of the peninsula, nearly two hundred miles southward. Additional study has shown it to be in other ways one of the most interesting fields in the United States for the fern student. It contains stations of two species not known to exist elsewhere in the United States, the extreme outlying southern stations for several northern species, and the corresponding northern stations for several tropical species. Small credits Florida with about one-third of the species of ferns in all America north of Mexico; almost half of the Florida species have come to light in these three counties.

Field work is far from complete, but 2,000 miles of automobile travel and hundreds on foot have enabled a pretty thorough scouting and much intensive work in the more promising portions. There has been especial care to visit every sink, cave, ledgy hillside or rocky hammock of which information could be gained, and many square miles of less promising hammock, pinewoods, swamp and prairie have been covered.

The explorations have revealed many thousands of acres of rocky pinewoods and hammock, once rich in ferns, where the last vestiges of all but one or two species

have been destroyed. The greater part of Florida is "open range," in which cattle and hogs wander freely and are exceedingly destructive. Very large areas in the three counties are so thinly settled that wild turkeys, wildcats, bears and deer are not uncommon, but there is no hammock so remote and no marsh island so inaccessible that they are not filled with the trails of domestic animals. At present the choicest fern habitat is a pasture for goats. There is an unfortunate custom of burning the undergrowth of the woodlands every year in the belief that better pasturage is so produced. Many of the stations where ferns are now found have been protected from fire by adjacent lakes or swamps.

The Pineola grottos illustrate the last statement. Both are on the borders of cypress swamps, and both receive further protection from lakes or ponds. They are notable for the abundance and luxuriance of the ferns, but the number of the species is remarkable for this region. Dr. Small listed fourteen species at the larger grotto, but as a result of intensive study our present list for it and its immediate environs—an area of no more than ten acres—is twenty-three. From the smaller grotto, distant one or two miles, eighteen species are recorded, two of which are not found at the larger grotto.

A continuation of field work through the coming winter, and an enlargement of the scope of observation are planned. Specimens of the more interesting species, together with notes embodying results of the study are in preparation for the herbariums of the State University of Florida, the New York Botanical Garden, and Cornell University.

A list of the ferns which we have collected within the three counties follows. The nomenclature is that of Small's *Ferns of Florida*. The notes appended are

based upon careful observation and immediate records, but are the product of only two years of study of these species and are subject to revision as well as enlargement.

BOTRYCHIUM OBLIQUUM Muhl. Grape Fern. Five stations in Hernando Co., two in Citrus, and two in Sumter. Probably it is generally distributed in the dryer portions of low hammock. The prevailing form is Underwood's *B. tenuifolium*. There is considerable variation in the forms of the leaflets.

OSMUNDA REGALIS L. Royal Fern. In the cypress swamps where the water level varies greatly it often resembles a tree fern, the slender trunk-like tussocks rising to a height of two feet. In several places plants have been found growing on dry vertical rocks, but no marked variation from the type appears.

O. CINNAMOMEA L. Cinnamon Fern. Less abundant, but not uncommon. The forma *frondosa* is often abundant.

ANEMIA ADIANTIFOLIA (L.) Sw. Apparently not previously recorded north of Miami. One isolated station in Hernando Co., and seven in Citrus, all in hammock. A pinewoods area ten miles long in northwestern Citrus Co. is thickly dotted with colonies of greatly dwarfed plants. In the hammocks it reaches a height of 22 inches: in the pinewoods mature fruited plants are often under 3 inches in height.

CERATOPTERIS PTERIDOIDES (Hook.) Hieron. Floating Fern. Along the Withlacoochee River in Citrus and Sumter counties, in stagnant or sluggish water, disappearing after frosts. Apparently buds on the decaying proliferous leaves survive under the surface of the water. Young plants make exceedingly rapid growth.

ACROSTICHUM DANEAEFOLIUM Langsd. & Fischer. Leather Fern. Common along the Gulf Coast rivers

and bordering swamps. Fronds 8 feet in height are frequent. Some plants resemble *A. aureum* in several characters.

POLYPODIUM PLUMULA H. B. K. Widely distributed through the three counties. A small form that rarely fruits is often very abundant on low boulders. Near lakes, rivers and swamps it is epiphytic. Farther from permanent water and near temporary ponds it usually appears on logs and stumps. In the dry hammocks it is almost wholly a rock fern, save as it is found on the clay banks of wet season water courses in Hernando Co.

P. PECTINATUM L. Much less abundant than *P. Plumula.* Most luxuriant on the banks of water courses in Annuttalagga Hammock, Hernando Co.; otherwise resembles *P. Plumula* in habitats.

P. POLYPODIOIDES (L.) Watt. Resurrection Fern. Everywhere on broad-leaved trees, especially the live oaks. It is not uncommon on rocks, and is very rarely found growing in leaf-mold.

PHLEBODIUM AUREUM (L.) J. Sm. Serpent Fern, Golden Polypody. Occasional colonies in the Gulf Coast hammocks and along the rivers, usually growing on cabbage palms. Very sparingly distributed in all but the driest hammocks of the three counties; where moisture is less abundant usually on logs or rocks.

VITTARIA LINEATA (L.) Smith. Grass Fern. Occasional in the Gulf Coast hammocks and along the Withlacoochee River. Once found on the trunk of a saw palmetto; otherwise always on cabbage palms.

PYCNODORIA CRETICA (L.) Small. Citrus and Hernando counties have each several stations, usually on the walls or earth banks of sinks. A colony of variety *albolineata* grows, apparently naturally, in Annuttalagga Hammock in Hernando County.

PTERIS LATIUSCULA Desv. Bracken. Everywhere in pinelands and dry sandy hammocks. The variety

pseudocaudata[1] is about as abundant as the type form.

ADIANTUM CAPILLUS-VENERIS L. Venus-hair Fern. A very beautiful station in a ravine-like sink in Hernando County, far south of its supposed range in the eastern United States. A reputed station in the northern part of the peninsula was found to be based upon immature plants of *A. tenerum*.

A. TENERUM Sw. Found in most of the larger sinks and grottos of Citrus and Hernando counties, and in several of the smaller ones. Generally it is not very abundant, probably because of frequent collection for cultivation—sometimes by truck loads.

DRYOPTERIS SETIGERA (Blume) Kuntze. Perhaps an introduced species, but widely distributed and well established. We have found one station in Citrus Co., one in Sumter Co., six in Hernando Co., and (outside of our special field) a chain of stations leading across Pasco and Polk counties to make connection with the earlier known stations in Orange and Seminole counties. Its range is fully 100 miles from east to west, and at least as great from north to south. It is a very beautiful lacy fern with fronds up to seven feet in height, and does well in cultivation.

D. ————————. A new species discovered in Annuttalagga Hammock by E. P. St. J., and as yet unpublished. It is a small fern rather closely related to *D. panamensis*. Only six plants have as yet been found, two of these being immature.

D. NORMALIS C. Chr. D. PATENS (Sw.) Kuntze. D. AUGESCENS (Link) C. Chr. We have not as yet done full justice to this puzzling group. All three species are undoubtedly present, but with intermediate and otherwise varying forms. Probably at least three unreported and

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[1] PTERIS LATIUSCULA Desv., var. **pseudocaudata** (Clute), n. comb. *P. aquilina* L., var. *pseudocaudata* Clute, Fern Bull. **8**: 39. 1900.

apparently undescribed species of *Dryopteris* are present. R. P. St. J. is giving special attention to the separation of these species.

D. THELYPTERIS (L.) A. Gray. Marsh Fern. Abundant in suitable places throughout the field. It is always fragrant, about as much so as the northern *Dennstaedtia* but with a more delicate flower-like odor. This is the only fern in our list of which we have never found a fertile frond between November and May.

D. FLORIDANA (Hook.) Kuntze. The beautiful southern counterpart of the northern *D. cristata.* Abundant in wet acid soil. Occasionally found growing in considerable colonies in dry sandy hammocks. Readily cultivated.

D. GONGYLODES (Schk.) Kuntze. Luxuriant colonies along the Withlacoochee River in Citrus and Sumter counties.

D. DENTATA (Forsk.) C. Chr. Widely but rather sparingly distributed through the three counties, usually in rocky places but sometimes in level ground in apparently acid soil, where it often grows along the shady side of a log.

HYPOLEPIS REPENS (L.) Presl. Three stations in the Choocochattee Hammock region in Hernando County. A chain of stations lead, outside our field, on to Dade City and Lakeland. It seems to be confined to springy hillsides in our region.

CHEILANTHES MICROPHYLLA Sw. A strong colony growing among eroded rocks at an elevation of 100 ft. in Citrus County. Formerly known in Florida only from aboriginal shell heaps along the coastal rivers.

BLECHNUM SERRULATUM L. C. Rich. Numerous stations near the Gulf Coast and the Withlacoochee River in Citrus and Sumter counties.

B. OCCIDENTALE L. Three stations, one containing several hundred plants, in Hernando County. Formerly known in the United States only from one station in our field. It is found along water courses in high hammock.

ANCHISTEA VIRGINICA (L.) Presl. Virginia Chain Fern. Abundant in low ground, thriving best in open sun.

LORINSERIA AREOLATA (L.) Presl. Net-veined Chain Fern. One of the most frequent ferns in cypress swamps and wet hammocks.

ASPLENIUM PLATYNEURON (L.) Oakes. Ebony Spleenwort. Common wherever rocks are found unless exterminated by fire. Often much larger than in its northern habitats. The incised form is frequent. It reaches its best development in low sandy hammocks among scattered boulders.

A. HETEROCHROUM Kunze. Black-stem Spleenwort. Widely distributed and usually abundant on rocks in all three counties.

A. RESILIENS Kunze. Less abundant than the preceding species, but the three counties have stations. It seems to prefer a drier habitat and usually a greater elevation than *A. heterochroum*. Some plants are hard to distinguish from that species.

A. ABSCISSUM Willd. Widely but rather sparingly distributed through the three counties, always on rocks and frequently in dry situations. A form in which the terminal pinna is as long as the remainder of the blade is found at a few stations. Plants in which the larger leaflets are slightly eared at the base are occasional.

A. BISCAYNEANUM (D. C. Eaton) A. A. Eaton. Supposed to be confined to two or three stations south of Miami, where it is approaching extermination. Plants which seem to belong to this species have been found in a deep sink in Citrus County. The identification has

Tectaria heracleifolia

been tentatively confirmed by W. R. Maxon. A series of specimens for further study is in preparation.

A. CURTISSII Underw. Abundant at the larger Pineola grotto. Three other small stations in our field. We know of only one other station, in Alachua County. It is endemic, as is the closely related preceding species.

A. CRISTATUM Lam. Known in the U. S. only from Sumter County. We have found six stations, in one of which it grows abundantly. Its habitat is low rocks in level hammock not far from permanent water.

A. VERECUNDUM Chapm. The most delicately lacy of our ferns. Except at Pineola not very abundant, but more widely distributed than the three next preceding species. Sometimes found on very dry vertical rocks, but makes its best growth in a moist atmosphere.

TECTARIA HERACLEIFOLIA (Willd.) Underw. Halberd-Fern. Abundant at the Pineola grottos. Occasional in the sinks of Citrus and Hernando counties. Forms in which mature fertile fronds resemble *T. minima* are found.

D. SUBTETRAGONA (Link) Maxon. Several stations in each of the three counties. We have always found it growing only among low outcroppings of rock, usually associated with *D. dentata.*

D. REPTANS (J. F. Gmel.) C. Chr. Creeping Fern. Fairly abundant in the grottos and present in several of the larger sinks. It prefers a drier habitat than any other of our rock ferns, usually appearing on vertical rocks and often under overhanging projections.

NEPHROLEPIS EXALTATA (L.) Schott. A few stations in Citrus and Sumter counties, usually growing on rocks, rarely on logs.

FLORAL CITY, FLORIDA

A List of Varieties and Forms of the Ferns of Eastern North America

C. A. Weatherby

I have been asked by one of the most active and interested members of the Fern Society to prepare a list of published varieties of East-American ferns, with brief description of each. No existing fern book, he points out, contains anything of the sort which is up to date or approaches completeness;[1] he thinks a full enumeration would be of use to those interested in the variations of our ferns, in naming their "finds" and generally in orienting themselves. What follows is the first installment of an attempt to meet this request. If, on trial, it proves really to meet a need, it will be continued.

Some preliminary explanation of method is necessary. It is assumed that the different *species* are known; only sufficient description of them is given to indicate the typical form. If a species is not mentioned at all, that means that no varieties have been described under it. Except in some special cases, no account is taken of varieties which have been regarded as such by some botanists and as species by others—*Thelypteris cristata* var. *Clintoniana*, for instance. These, as a rule, are sufficiently accounted for in the books. Some recently proposed species, however, the status of which is still in doubt, are discussed. In species common to both America and Europe, only forms known to occur in the former are included. It must be remembered, however, that many American forms were first described by European botanists; reference to their works will consequently often be made. When the names used are not those in current fern-books, the more familiar names are given as syn-

[1] The most comprehensive, Prof. Clute's Check-list, has no descriptions.

onyms, in parentheses. In each case, the place of publication of the combination used is given and usually that of the original description also, if the two are not the same. Often the later reference gives the better description.

If a list like this is to be anything more than a hodge-podge of names, it must conform to some system of classification. Even at the cost of some new combinations I have tried to fit all items here considered into the scheme of species, variety and form in use at the Gray Herbarium. Since living nature is not standardized, but plastic and endlessly experimenting, no exact definition of these categories is possible; but some statement of principle can be made. Species, as here understood, differ from one another in two or more characters which experience has shown to be of importance in classification and which are stable. Thus, Goldie's fern and marginal shield fern differ constantly in texture, shape of pinnae, position of sori and cellular structure of scales and indusium. Except for rare individuals which can reasonably be interpreted as hybrids, there are no intermediate forms. Therefore, these are good species—and are universally so considered. Varieties differ from one another in few characters of less importance and are connected by intermediate stages; or, they may differ by no more than one minor character, but have distinctive geographic ranges. *Osmunda cinnamomea*, var. *glandulosa* departs from the typical form only in the presence of a glandular pubescence; but whereas the latter is very wide-spread, the glandular strain occurs only in a restricted area near the coast in the eastern United States (Rhode Island to Maryland). It is therefore regarded as a geographic variety (a concept very familiar to ornithologists). Forms differ in a single character of least importance (such as degree of cutting of the leaf),

or are obvious abnormalities (such as *Onoclea sensibilis*, f. *obtusilobata*) and may occur sporadically anywhere within the range of the species.

Until we know all that is to be known about plants, classification must necessarily be somewhat a matter of individual opinion. If, in the course of this attempt, I am betrayed into the expression of too much of mine, the reader has my apologies. I can only cherish the hope that he may find in it some degree of illumination.

Ophioglossaceae

Botrychium simplex Hitchcock, American Journal of Science **6**: 103, plate 8 (1823).—Sterile blade pinnately parted, with 1–3 pairs of nearly equal lateral lobes. Forma *incisum* Milde, Nova Acta **26**: 666 (1858) is essentially this typical form.

Forma simplicissimum (Lasch) Milde, l. c.[1] *B. Kannenbergii*, f. *s.* Lasch, Botanische Zeitung **14**: 607 (1856). Sterile blade quite entire.

F. subcompositum (Lasch) Milde, l. c. *B. K.*, f. *s.* Lasch, l. c.—Sterile blade with about 3 pairs of lateral lobes, the lowest pair distant from the others, much larger than they and with a long, narrow, stalk-like base.

F. compositum (Lasch) Milde, l. c. *B. K.*, f. *c.* Lasch, l. c.—Sterile blade with 3 (rarely 2 or 4) equal divisions, each lobed about as in the preceding form.

The above forms are regarded by Davenport and Bower as stages of development, the first young or dwarfed individuals, the last fully developed ones. A detailed account, with numerous illustrations, may be found in Davenport's "Notes on Botrychium simplex." Milde also gives good illustrations.

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[1] One friend to whom part of this manuscript was shown, complained that he had to look in the dictionary for "l. c." It may therefore be explained that it is an abbreviation for a Latin phrase meaning "at the place last mentioned"—in this instance Nova Acta **26**: 666.

"Forma" will hereafter be abbreviated "f.".

In *B. tenebrosum* A. A. Eaton, Fern Bulletin 7: 8 (1899), often regarded as a variety or merely a shade-form of *B. simplex*, the sterile blade, though it may be three inches long with four or five pairs of lobes, shows no tendency to the three-parted division characteristic of the more developed forms of the latter species, but remains simply pinnate with small entire segments.

Farwell, Report Michigan Academy Sciences, **18**: 87 (1916), considers this the same as *B. simplex*, var. *angustum* Milde, Botrychiorum Monographia 140 (1869).

BOTRYCHIUM LUNARIA (Linnaeus) Swartz, Schrader, Journal for 1800: 110 (1801). *Osmunda L.* Linnaeus, Species Plantarum 1064 (1753).—Pinnae close together, sometimes overlapping, all of about the same size except at the extreme tip, broadly crescent-shaped, the outer margin nearly entire, the sides curving inward.

F. SUBINCISUM (Roeper) Milde, Sporenpflanzen Deutschlands 82 (1865). *B. L.*, var. *s.* Roeper, Zur Flora Mecklenburgs 111 (1843).—Outer margin of pinnae coarsely but shallowly toothed.

F. INCISUM (Milde) Holmberg, Skandinaviens Flora 33 (1922). *B. L.*, var. *i.* Milde, Nova Acta **26**: 661 (1858). —Pinnae deeply cut into oblong or somewhat fan-shaped, truncate lobes.

F. OVATUM Milde, Nova Acta **26**: 662 (1858).—Lower pinnae longer than those above, giving the sterile blade an ovate outline, instead of the typical oblong one.

F. **tripartitum** (Moore), n. comb. *B. Lunaria*, var. *tripartitum* Moore, Nature-printed British Ferns, octavo ed. 2: 324 (1859).—Lowest pinnae much elongated and themselves pinnately parted, forming a 3-parted leaf after the manner of *B. simplex*, f. *compositum*.

B. onondagense Underwood, Bulletin Torrey Botanical Club **30**: 47 (1903), differs from typical *B. Lunaria* in its thinner texture and its comparatively widely separated pinnae which are fan-shaped with straight sides. It is now more often regarded as a shade-form, or at

most a variety, of *B. Lunaria* (var. *onondagense* (Underw.) Clute, Fern Bulletin **14**: 80 (1906)) than as a species. Though originally described as American, it occurs also in Europe, where it has been independently described (according to Victorin) as *B. Lunaria,* subforma *remotum* Wirtgen (1924).

B. minganense Victorin, Contributions du Laboratoire Botanique de l'Université de Montréal **11**: 331, plates 1 & 2 (1927), is characterized by somewhat spoon-shaped pinnae, the sides of which curve outward from the base into a nearly circular blade, and by the larger average size of its spores, 36.6 μ according to Victorin, as against 29.8 μ in *B. Lunaria.* At its type locality *B. minganense* sported freely; incised and branching forms there produced are scarcely, if at all, distinguishable from the forms of *B. Lunaria* above enumerated, except by spore-measurements.

Botrychium matricariaefolium A. Braun ex Koch, Synopsis Florae Germanicae, ed. 2: 972 (1845) (*B. ramosum; B. neglectum*).—Sterile blade lanceolate to ovate in outline, pinnate with the pinnae deeply cut or lobed. F. *subintegrum* Milde, Nova Acta **26**: 687, figs. 190, 191 (1858), is a less cut phase of the typical form; so is var. *rhombeum* (Angstr.) Farwell, Report Michigan Academy Sciences **18**: 85 (1916).

F. **gracile,** n. comb. *B. neglectum,* forma *gracile* House, Bulletin New York State Museum **254**: 13 (1924.)—Pinnae nearly or quite entire—a juvenile condition which sometimes persists in well-developed plants.

F. palmatum Milde, op. cit. 689, figs. 185–187.—Sterile blade triangular in outline, one or two pairs of lower pinnae much enlarged and themselves pinnate.

F. compositum Milde, op. cit. fig. 188.—Sterile blade equally 3-parted, each part like a well-developed blade of the typical form.

B. matricariaefolium is here considered as a single species occurring both in Europe and America; it was,

however, founded on a European plant. The American was set apart by L. M. Underwood as *B. neglectum* Wood; he has been followed by Britton and other authors. So far as I know, no one has made any statement of characters whereby the American plant may be distinguished from the European. I have never noted any except a tendency to greater fleshiness in European specimens. It seems strange that Underwood should have separated off *B. neglectum* and yet have left the much more readily distinguishable *B. angustisegmentum* under *B. lanceolatum*. If *B. neglectum* is maintained, only the name f. *gracile* of those given above can be used under it; for Milde's forms, which were based on European material, new names must be coined.

BOTRYCHIUM DISSECTUM Sprengel, Anleitung zur Kenntniss der Gewächse 3: 172 (1804).—All divisions of the bipinnate-pinnatifid[2] sterile blade deeply cut into linear teeth or lobes.

F. OBLIQUUM (Muhlenberg) Fernald, Rhodora 23: 151 (1921). *B. o.* Muhlenberg ex Willdenow, Species Plantarum 5: 63 (1810).—Sterile blade bipinnate-pinnatifid, middle pinnae pinnate toward base; terminal segments of pinnae (*i.e.*, the merely lobed portions) oblong-ovate or oblong-lanceolate, acute; basal segments of basal pinnules of lowest pinnae not much exceeding the others; segments merely serrulate.

F. ELONGATUM (Gilbert & Haberer) Weatherby, Rhodora 23: 209 (1921). *B. o.*, var. *e.* Gilbert & Haberer, Fern Bulletin 11: 89 (1903).—Like the preceding, but basal segments of basal pinnules of lowest pinnae much longer than the others, half as long as the pinnule.

F. ONEIDENSE (Gilbert) Clute, Fern Bulletin 10: 76 (1903). *B. ternatum*, var. *o.* Gilbert, Fern Bulletin 9: 27 (1901).—As in f. *obliquum*, but terminal segment broadly ovate, obtuse. Sometimes placed with *B. multifidum* (*B. ternatum*, var. *intermedium*; *B. silaifolium*).

[2] This means that the blade is completely twice pinnate, with the divisions of the third order also pinnate, but incompletely so.

Var. TENUIFOLIUM (Underwood) Farwell, Papers Michigan Academy Science 3: 80 (1924) *B. t.* Underwood, Bulletin Torrey Botanical Club 30: 52 (1903). Sterile segment not more than bipinnate, middle and upper pinnae often quite unlobed. Found chiefly in the southern states, where it largely replaces f. *obliquum*.

Botrychium obliquum, var. *Habereri* Gilbert, Fern Bulletin 11: 88 (1903) is only a renaming of D. C. Eaton's *B. ternatum*, var. *australe* (a name not properly applicable to any North American plant) and belongs with *B. multifidum*, var. *intermedium*. *B. obliquum*, var. *oblongifolium* E. W. Graves, Fern Journal 22: 50, plate 4 (1932) I do not know well enough to place it clearly. Mr. Graves discusses all these forms in detail in an article shortly to be published in this JOURNAL.

There has been much difference of opinion as to the status of *B. obliquum* and *B. dissectum*. Underwood and his followers regard them as separate species, although every conceivable intermediate can be found, often in a single colony. At the other extreme, Fernald regards them as only forms of a single species. This disposition is logical under the system here followed, since they differ only in the degree of cutting of the leaf, and I have accordingly adopted it. It should be pointed out, however, that in most cases known to me in which a species has a more and a less cut form, the former is sporadic and, though capable of reproduction by spores, does not perpetuate itself in any quantity in nature. *B. dissectum*, on the contrary, is common and obviously well established.

GRAY HERBARIUM,
CAMBRIDGE, MASSACHUSETTS

On Certain Mexican and Central American Ferns

C. A. WEATHERBY

DRYOPTERIS (*Goniopteris*) **Schippii,** sp. nov., rhizomate erecto brevi, paleis ovatis acutis integris minute stellato-puberulis onusto; frondibus fasciculatis; lamina coriacea ovata vel late lanceolata ad et supra medium pinnata in apicem acuminatum pinnatifidum sensim angustata; rachi dense stellato-puberulo pilis longioribus simplicibus intermixtis; pinnis medialibus oblongo-lanceolatis leviter falcatis obtusis ¼ ad costam lobatis, lobis falcatis obtusis, costis costulisque pilis simplicibus sparse obsitis parenchymate glabro; venulis 4–6-jugis simplicibus basalibus plerumque infra sinu conjunctis; soris inframedialibus indusio parvo brunneo setoso persistente praeditis.

Rhizome short, erect, its scales ovate, acute, entire, membranaceous, rather densely and minutely stellate-puberulent, attached at the margin, their cells oblong with delicate walls. Fronds clustered, 6–7.5 dm. long. Stipe about as long as the lamina, grayish-brown, channeled above when dried, stellate-puberulent in the upper part, glabrate below. Lamina coriaceous, ovate or broadly lanceolate, 1.7–3.3 dm. long, 10–13 cm. broad, pinnate up to and somewhat beyond the middle, thence narrowed gradually to a long, acuminate, pinnatifid apex; rachis grayish-brown, grooved above, densely stellate-puberulent with longer simple hairs intermixed, toward the apex often proliferous; larger pinnae 7–11 pairs, the lowest shorter, more or less reflexed, elliptic, shallowly lobed near the middle, thence narrowed below to an entire-margined, very inequilateral base, cuneate on the lower side, rounded, subtruncate or somewhat auricled on the upper, above to an entire obtuse nearly equilateral apex; medial pinnae patent or somewhat ascending, oblong-lanceolate, slightly falcate, 4–7 cm. long, 1.3–1.8 cm. broad, rather abruptly contracted to an obtuse apex, inequilaterally truncate at base, the lower side free, the upper narrowly adnate, lobed about ¼ of the way to the midrib; costa toward the base stellate-puberulent, above with mostly simple hairs; lobes broad, approximate, obtuse, falcate, sparsely beset with simple

hairs on costules, veins and margin, leaf-tissue glabrous; veins 4–6 pairs, simple, the basal pair usually united with those of the adjoining lobe in the leaf-tissue below the sinus; upper pinnae gradually reduced and passing into the pinnatifid apex of the lamina, subentire, broadly obtuse, narrowly adnate on both sides at base. Sori orbicular, inframedial, with a small, brown, coriaceous, persistent, setose indusium, its cells with straight walls. Mature spores not seen.

Shady banks, alt. 50 ft. Machaca Creek, British Honduras, April 10, 1934, *W. A. Schipp* no. 8–782 (TYPE in Herb. Gray).

The above description is drawn chiefly from the type specimen. M. E. Peck's no. 929 collected in forest at Toledo, British Honduras, Jan. 25, 1907 is also referred here. In it the lamina passes more abruptly into the pinnatifid apex, the median pinnae are more nearly fully free from the rachis, and the simple hairs in the pubescence are more numerous, but it agrees otherwise and in all essentials with the type.

In Christensen's key to the subgenus *Goniopteris* (Mon. Dryopt.; Dansk. Vidensk. Selsk. Skr. X. 202) *D. Schippii* falls between the groups of *D. hastata* and *D. serrulata*. In *D. Schippii* the pinnatifid apex is broken at the base into a larger number of reduced and entire but fully separate pinnae than in the former group; through these pinnae the transition to the apical portion is much more gradual than in the latter. From *D. Peripae* (Sod.) C. Chr. (as described and illustrated by Christensen) *D. Schippii* differs, besides, in the glabrous leaf-tissue and in having the lamina broadest near the base instead of well above it. From *D. hastata* it differs also in having only one pair of veins united below the sinus. From *D. serrulata* it is at once separated by the gradually upward-attenuate lamina and the much smaller number of pinnae, by their obtuse apices and

by the pubescent rachis. The tendency to proliferation is apparently not unusual in this general group.

It is a pleasure to name this interesting species after its keen and discriminating collector.

A word of explanation of my use of the generic name *Dryopteris* instead of *Thelypteris* is perhaps needed. I still believe that *Thelypteris* has the better standing. But *Dryopteris* has been unanimously employed by recent pteridologists working with tropical ferns; to reject it now means the renaming of hundreds of species, many of them already once renamed within thirty years; and it has been proposed for conservation, though perhaps too late to be considered at the Congress of 1935. For these reasons, I defer to established usage.

POMATOPHYTUM POCILLATUM M. E. Jones. This was published, in Cont. West. Bot. xvi. 12 (1930), as a new genus and species of ferns from Arizona and Chihuahua. On the labels of a later collection, however, Jones wrote "probably *Cheilanthes lendigera*." This is entirely correct; the plant, as shown by a specimen of the type collection before me, is exactly *C. lendigera* (Cav.) Sw. as at present understood.

It is possible that *C. lendigera* may at some future time, be successfully segregated generically from *Cheilanthes*. As now treated, it is a species of wide range, from Ecuador to Arizona; its more northern element may perhaps be separated from that of South America. It is also possible that Cavanilles's name may prove to have been misapplied. The object of this note is to point out that even though all three of these things should happen, neither Jones's picturesque and excellently descriptive generic name, *Pomatophytum*,[1] nor his equally vivid specific epithet, can be used, because of earlier synonyms.

[1] "Pocket-plant" applies admirably to the pouches formed by the relatively very broad indusia across the rounded apices of the small ultimate segments.

A. DRYOPTERIS SCHIPPII, × ½; A1, PORTION OF A PINNA, × 1. B. POLYPODIUM BARTLETTII; FIGS. 1–3, FRONDS, × 1; FIG. 4, SCALE FROM UPPER SURFACE OF LAMINA, × 10; FIG. 5, SCALES FROM LOWER SURFACE, × 10; FIG. 6, SCALE FROM RHIZOME, × 10.

In his Genera Filicum, 148, t. xii, figs. 1–4 (1850–52), Fée proposed the genus *Myriopteris*. It was obviously intended to include all the much-dissected scaly and hairy species of *Cheilanthes* with numerous, small, rounded ultimate segments, and no type was cited. But the illustration chosen to represent the genus (t. xii, figs. 1–4) is mainly of *Cheilanthes lendigera*. Fée applied this name to a non-indusiate species, and called the Mexican plant *Myriopteris Marsupianthes* "Cheilanthes lentigera Mart. & Gal. *non auct.*"; and his section *Eumyriopteris* consisted of four species, three of them now regarded as states of *C. lendigera*, the fourth *C. tomentosa*. Under these circumstances, it is reasonable if not inevitable, to take the Mexican *C. lendigera* as the type of Fée's genus, which, therefore, becomes directly synonymous with *Pomatophytum*, the Arizona station being but the northernmost outlier of the Mexican plant. And, as above noted, three specific names of Fée are in all probability likewise applicable to it.

POLYPODIUM HARRISII Jenm. This species, hitherto reported only from Jamaica and Hispaniola, may now be recorded from Central America. It was collected on the Guatemala-British Honduras boundary by W. A. Schipp, no. 8–801 in pt.

POLYPODIUM (*Pleopeltis?*) **Bartlettii,** sp. nov., rhizomate repente frondes singulos distantes emittente, dense paleaceo, paleis non piliferis, aliis linearibus acuminatis 2–3 mm. longis saltem basin versus vitta mediali atrobrunnea ornatis margine pallide brunneis hyalinis eroso-serrulatis, aliis minoribus orbiculatis; lamina coriacea ambitu varia inferne $\frac{1}{2}$–$\frac{7}{8}$ ad rachin irregulariter pinnatifido-lobata ad apicem obtusum vel subacutum versus integra, pagina inferiore paleis nunc suborbicularibus peltatis appressis nunc e basi peltato lanceolatis caudato-acuminatis eroso-serrulatis brunneis subdense, pagina superiore paleis pallidis albescentibus plerumque ovato-lanceo-

latis caudato-acuminatis lacerato-serratis sparsius onusta; venatione propter crassitiem laminae opacae dubia, ut videtur Goniophlebii; soris immersis supramedialibus, paleis minutis irregularibus non evidenter peltatis sporangiis intermixtis.

Rhizome creeping, densely paleaceous, the scales not trichome-bearing, of two kinds, one linear from a peltate base, acuminate, 2–3 mm. long, at most 0.5 mm. wide, at least toward the base with a dark-brown median band composed of elongate sclerotic cells almost without lumina, the margins pale-brown, hyaline, erose-serrulate, the other kind smaller, orbicular or ovate, peltate, hidden by larger scales. Stipe about as long as the lamina or shorter, up to 4.5 cm. long, terete, brown or blackish, above very narrowly green-margined by the decurrent lamina, rather densely beset with scales, some suborbicular, peltate and appressed, some lanceolate from a peltate base, caudate-acuminate, somewhat spreading, erose- or pectinate-serrulate, fuscous at the point of attachment, elsewhere brown. Lamina coriaceous, lanceolate, ovate or deltoid, 3–5.5 cm. long, 1–4 cm. broad, below irregularly pinnatifid, the lobes cut $\frac{1}{2}$–$\frac{7}{8}$ to the midrib, cuneate or subtruncate at base, entire toward the obtuse or subacute apex, on the lower surface densely beset with scales similar to those of the stipe, on the upper more sparsely beset with pale, finally whitish, mostly ovate-lanceolate, caudate-acuminate lacerate-serrate scales; midrib green above, nigrescent below; lobes very variable in length and outline, from linear to obovate, obtuse, entire. Venation difficult to make out because of the opacity of the lamina, apparently goniophlebioid. Sori immersed, the sporangia mingled with minute irregular, not evidently peltate scales, their cells with large lumina and thick brown walls. Spores not seen.

On tree-trunks, ridge above Mesa de Tierra, vicinity of San José, State of Tamaulipas, Mexico, 12 July, 1930, *H. H. Bartlett*, no. 10286 (type, sheet no. 1490631 in U. S. Nat. Herb.; fragm. in Herb. Gray).

An anomalous plant, difficult to place certainly in the recognized groups of *Polypodium* and perhaps not the normal form of the species. Its irregular leaf-cutting,

its apparently subgoniophlebioid venation, and the seemingly imperfect development of peltate scales among the sporangia, suggest a hybrid of *P. polylepis* and *P. polypodioides;* but the scales of the upper surface of the lamina are quite different in both of those species. In its irregular cutting and dubious venation, it also strongly suggests the South American and West Indian *P. leucosporum*, but it is a much smaller and more slender plant and differs obviously in details of scale-structure. It may tentatively be placed in the group of *P. lanceolatum*, occupying somewhat the same relation to that species as does the pinnatifid *P. sordidulum* Maxon & Weatherby to *P. astrolepis.*

POLYPODIUM MOLLISSIMUM Fée. In his very excellent treatment of the ferns of Porto Rico (Sci. Surv. Porto Rico and Virgin Is. vi. pt. 1, 412), Maxon clearly distinguishes this species from *P. cultratum* Willd., with which it has been confused, and gives its range as through most of the West Indies and from Guatemala to Panama. It may also be recorded from southern Mexico; a specimen from Chiapas in the Gray Herbarium, *Ghiesbreght* no. 318, is clearly referable to it.

It may be noted, however, that both in the Ghiesbreght specimen and in some of the collections from Guatemala and adjacent British Honduras (*Tuerckheim* 8056 and 8366; *Schipp* 8767), the lower surface of the lamina is more densely pilose with longer hairs than in typical *P. mollissimum.* In this respect these collections approach *P. cultratum*, but both the hairs of the leaf-surface and the setae of the sporangia are markedly shorter and finer than in that species. In this one character, the Mexican and Central American form is intermediate between *P. cultratum* and *P. mollissimum;* in all others, it plainly belongs with the latter.

So far as shown by the abundant collections in the United States National Herbarium and the Gray Herbarium, all *P. mollissimum* from the West Indies is of the typical form. It occurs also in Central America—*Maxon & Hay* 3199 from Guatemala is representative.

GRAY HERBARIUM, CAMBRIDGE, MASS.

Two Recent Fern Books

EDGAR T. WHERRY

Blomquist, H. L.—Ferns of North Carolina. xii + 131 pages, 79 figures. Duke University Press, Durham, N. C. December, 1934. $2.00.

This work begins with a thirteen page introduction by D. C. Peattie, in which the significance, biology, and distribution of ferns are interestingly treated. Then there is a brief discussion of the method of using the dichotomous keys to families, genera and species, which follow. Some seventy species and a few varieties of ferns and fern-allies are taken up, with an excellent line drawing of each. Under the species heading noteworthy features are enumerated, followed by statements of habitat and of distribution in the state, by counties. The book is well printed and attractively bound, with *Dryopteris goldiana* as a cover ornament.

The publishers apparently failed to give the author sufficient opportunity for checking and correcting the text, and, as a result, several errors in author's names have slipped in. Thoreau appears minus his first name, Henry, on page 3; the collector referred to on page 52 was J. H. Ferriss; and our authority on *Equisetum* (page 100) is named Schaffner. *Pteridium latiusculum* var. *pseudo-caudatum* should be attributed to Maxon; *Pteris serrulata* to L. f.; *Thelypteris* to Schmidel; *Athyrium angustifolium* to Milde; and *Selaginella* to Beauvois.

Two minor points of nomenclatorial procedure seem worthy of commendation. Following the lead of U. S. Government publications and of Biological Abstracts, the author has courageously decapitalized all species names, in spite of the International Code ruling that some (though not all) derived from proper names are to be capitalized. Again, he follows Christensen in the use of *Dryopteris* for the shield ferns, which it is well to do until some one monographs them under another name. There is, however, one serious taxonomic error here, namely the use for the "broad spinulose wood fern" of *Dryopteris dilatata*. As pointed out by Fernald years ago, this name belongs to the European-west American plant, from which the eastern one is wholly distinct; when the latter is treated as a species, its name should be *Dryopteris campyloptera* Kunze.

The keys seem for the most part well adapted to differentiate the plants, although in a few places they may confuse a beginner. On page 37, second heading A, another exception to free venation should be inserted, namely *Camptosorus*. The use of sori in the plural and indusium in the singular under heading J makes it sound as though an indusium were a broad structure covering all the sori. Since first heading K applies only to the beech-ferns, the words "in part" should be added after 9. *Dryopteris*. Second heading K describes the usual forms of *Polypodium*, but forma *deltoideum* (which the reviewer has seen in North Carolina) has decidedly triangular blades. In the genus key to *Cheilanthes* on page 48 the use of "leaves" for one separation and "fronds" for the next seems likely to mislead the beginner into thinking them to mean something different. At the bottom of page 56, after "blades not deltoid," an exception should be made for the broad wood fern, no. 10. For distinguishing species of *Dryopteris* additional features

such as evergreen or deciduous character, color of scales, and positions of sori might well have been inserted.

The drawings are for the most part so well executed that the species they represent can be told at a glance, but a few minor improvements might be suggested. The pinnules of the interrupted fern should be shown as blunter than those of the cinnamon. From their pictures alone the two woodsias would be hard to tell from one another or from other ferns. The specimen used for the sketch of the lower part of the frond of the spinulose wood fern must have been an abnormal one, with the second pair of pinnules not fully developed. In the mountain spleenwort the lobes should be more sharply toothed. A useful diagnostic character of the Virginia chain fern, the dark-colored stipe, is not shown. Finally, several of the illustrations would have been improved by a one-third reduction in size.

It is much to be regretted that the ecological and geographical relations discussed under individual species have been compiled in part from antiquated and untrustworthy sources, without sufficient references to the pages of this JOURNAL. In urging search for *Ophioglossum engelmanni* in the state there might well have been added "in places where the soil is rich in lime." The range of *Botrychium obliquum* is not limited by the Mississippi River. Climbing fern grows in low moist thickets only when the soil there is extremely acid; and a record for Duplin County was published in this JOURNAL 22: 86. 1932. On page 50 Missouri should be stricken from the list of states for *Cheilanthes tomentosa*, since it is not included in the carefully compiled account of the ferns of that state recently published in our pages. In discussing the relations of the genus *Cystopteris* the words "United States" should be substituted for "North America," for there is a third species in the northeastern

part of the continent. *Cystopteris fragilis* shows no preference for limestone, but *C. bulbifera* does, and this might have been given as a reason for its rarity in the state.

The range of "*Dryopteris dilatata*" will of course be narrowed when the eastern and western plants are separated. There are two authentic records of the long beech fern in the state, on Mount Mitchell and in the higher parts of the Smokies. "Rich river banks and flood plains" are not the most typical habitats of *Polystichum acrostichoides*, for it becomes abundant on steep rocky slopes in open woods. One of the reasons for considering *Athyrium asplenioides* a distinct species is its limitation to a restricted southeastern range instead of being "widely distributed in eastern North America."

When misstatements as to habitat or range once get into the literature, it seems almost impossible to correct them. Although the error in attributing *Asplenium pinnatifidum* to Connecticut has been pointed out in at least three articles (Rhodora **22**: 85; this JOURNAL **18**: 21; Conn. Geol. Nat. Hist. Survey Bull. **48**: 10.), it is still attributed to that state on page 84. Its actual present known range is southeastern Pennsylvania to northern Georgia and eastern Oklahoma. One of the best distinguishing characters of *Asplenium resiliens* is the black color of its rachis, so it is disappointing to find this here described as "dark-brown"; moreover, its characteristic substratum is limestone, and it occurs but rarely on igneous rocks, and probably never on true granite.

Asplenium cryptolepis is probably even rarer in North Carolina than here considered, for specimens so labelled which the reviewer has seen from one or two of the counties mentioned have been misidentified *A. montanum*. The latter is shown in recent FERN JOURNAL articles to range from Massachusetts southward, but is

not known in the southwest, as stated. Another example of the difficulty of withdrawing an error once it gets into print is to be found on page 92, where *Asplenium bradleyi* is "said to prefer limestone." However, there is no limestone in Gaston County, where it is so abundant, and over three years ago in this JOURNAL 21: 111 the reviewer pointed out the falsity of this book-statement. At least one other eastern North American fern roots at the tip, as noted in Small's Ferns of Florida, page 171,—*Dryopteris reptans*.

Coming to the fern-allies, it would take more than a specimen carelessly labelled "Statesville" by an amateur to convince the reviewer that *Equisetum scirpoides* has ever been collected so far out of range as the North Carolina piedmont. While *Selaginella apoda* belongs to a South American group, it is too widely distributed in North America to be regarded as a recent introduction. The county list for the rare *S. tortipila* seems rather large. The habitat of *S. rupestris* is inadequately described, for in addition to growing "on rocks near streams" it occurs in abundance high on cliffs, as at the famous Blowing Rock, and even on mountain summits, notably Mount Pisgah.

The common names given for the various species are either the book names, which in many cases are not in common use by any one, or translations of the technical names. In the opinion of the reviewer, local plant lists should whenever possible include common names actually in use in the region covered. When no information as to these is at hand, a common name may be coined, but since technical names are selected on the basis of priority rather than appropriateness, direct translations should not be used indiscriminately.

For *Pteridium latiusculum* the preferable common name is "Eastern bracken"; following Standardized

Plant Names, the term brake may well be reserved for members of the genus *Pteris*. The one species of the latter included here has, however, two widely used common names which should be mentioned: Huguenot fern and spider fern. Perhaps southern maidenhair fern is preferable to venus-hair fern for *Adiantum capillus-veneris*. There is certainly an objection to the term purple cliff-brake for *Pellaea atropurpurea* since there is nothing about it correctly described as purple; a suitable, descriptive, substitute would be hairy cliff-brake. The prefix "hair-" should be dropped from the names for the three species of *Cheilanthes*.

The prefix "common" is rarely desirable in plant names because whether a given species is common or not depends on one's location; and for *Dryopteris intermedia* the reviewer certainly favors a short term such as Evergreen wood-fern in place of the four-word one here used. Now that *Athyrium pycnocarpon* has been taken out of the genus *Asplenium* it is no longer a "spleenwort," and that its species name is not *angustifolium* it is no longer "narrow-leaved." The reviewer would favor calling it "glade fern" in reference to its characteristic development in woodland glades. "Pinnatifid spleenwort" is too hard to pronounce to find much favor as a common name, and "lobed spleenwort" seems preferable. Since *Asplenium resiliens* is not conspicuously distinguished from its relatives by its elasticity the term "elastic spleenwort" seems rather inappropriate, but "black-stem spleenwort" would be a really distinctive substitute.

This series of corrections and suggestions has been presented at length in the hope that users of the book under review will enter them in their own copies, and especially in any copies likely to be used by future compilers of habitat and distributional data. After all, there is an

average of but one such item for every two pages, and on the whole the work is so well planned and illustrated that it is sure to find a wide field of usefulness.

Frye, Theodore C.—Ferns of the Northwest. v + 178 pages, 62 figures. Metropolitan Press, Portland, Oregon. 1934. $2.00.

In some respects this book is superior to the one just reviewed. It covers a much larger area—British Columbia to central California and east to Wyoming. The introduction contains more technical matter, notably a discussion of the evolutionary relations among the various groups of Pteridophytes. The keys are more elaborate, and a full description of each species is also given. Many of the figures are really plates including drawings or habitat photographs of several species. Distributions within the region covered are given in detail, with citations of collectors or references to the literature. Data as to local interest in or significance of individual species are added in many cases. And there is a bibliography of 149 references, including many from the pages of this Journal, though omitting several important articles.

Decapitalization of all species names and *Dryopteris* for the shield ferns are also adopted here. The author prefers the terms leaf to frond, leafstalk to stipe, and thallus to prothallus, but somewhat inconsistently retains pinnae and pinnules. The Lycopodiums and most of the other fern allies are considered primitive and are taken up first, but the water-ferns are placed at the end of the list.

The illustrations vary in quality. Some of the halftones are not good enough to justify the expense of putting them in. The drawings are mostly excellent, but it seems unfortunate that members of wholly unrelated genera had to be mixed on several plates.

Interesting data are given as to uses made of certain species by the Indians, although these are often mixed with references to the uses of related species in remote countries in a somewhat confusing way. Having long been impressed with the danger of trying unknown plants as food, the reviewer always regrets the appearance of articles urging the use of fern fiddleheads in this way. For some reason the writers of such articles usually favor the bracken for trial; so in preparing for this review, search was early made for what might be said here about the northwestern bracken. On page 80 we learn that "goats are the only stock that will eat brakes." On the next page there are some irrelevant remarks about the uses of the shoots by the French and the Japanese—irrelevant because different varieties if not species are concerned. Then there is the significant remark that "the taste has a suggestion of the almond,"—a danger sign known to every chemist as indicating the possible presence of deadly cyanides. But the author misses this point and proceeds to furnish a reference to recipes for cooking and to favor the canning of fern tips like asparagus. On page 82 some medicinal uses of the plant are noted, and the remark made that it "is suspected of being poisonous." No mention is made of the recent discovery that if sheep are fed the northwestern bracken and then brought out into the light, they suffer from severe hemorrhages.

Taxonomically this work is on the whole satisfactory, except that the author's tendency to lump species is carried to an extreme which leads to some real misinterpretations. Thus *Lycopodium selago* and *lucidulum* are given as synonymous, and a good drawing of var. *patens* of the former is said to be "by some called *L. lucidulum*." It may be so called by some western amateurs, but is certainly not the eastern plant so named by

Michaux. In spite of the careful work of Hieronymus, Maxon, and others on the spore-characters of the western Selaginellas once confused with *S. rupestris*, the latter name is here retained with the remark that "If such minor characteristics are specific, let us hope that no taxonomist undertake a revision of the genus *Homo*."

Adiantum pedatum var. *aleuticum* is not admitted as separable from the eastern phase of that species, resulting in overlooking the geographic significance of the two; the excellent figure given is unmistakably of the variety named, but is not so labelled. *Cheilanthes lanosa* is erroneously given as a synonym of *C. feei*, presumably as an expression of the same feeling that lumping is desirable. A series of Polypodiums of widely divergent aspect is lumped as *P. vulgare*, with remarks as to their being ecological forms of one another,—a conclusion not concurred in by some well qualified fern students.

While the locality data for the area covered are good, the statements as to ranges elsewhere are carelessly compiled or proof-read. Thus *Lycopodium inundatum* is said to range south to Ga., perhaps by misprint for Pa.; *L. complanatum* to Va. whereas the typical phase of the species does not come nearly so far south, the var. *flabelliforme* much farther. Schaffner is said to be followed in the treatment of *Equisetum*, but is certainly not followed in making *E. hiemale* synonymous with *E. praealtum* and having the former extend south to N. C. *E. arvense* is not attributed to the eastern U. S. at all, whereas it is well known to occur from New England to northern Alabama. (B. C. may be a misprint for N. C.)

Botrychium simplex is stated to range south only to Mass., although it has long been known in Pennsylvania; *B. minganense* should be extended at least as far as Vermont. *Adiantum pedatum* is given as ranging to Va., presumably a misprint for Ga., which would be correct.

On the other hand a similar misprint on page 88 has the boreal *Cryptogramma stelleri* going south to Ga., instead of Pa. *Pellaea glabella* is said to stop in Pa., but there have been records of it in this journal from Va. The most serious misstatement of this sort occurs in the next species, *P. andromedaefolia,* which is not known to occur east of California and Nevada, but is here ascribed to most of the eastern states, including Vt. and Fla. Evidently the author's tendency to lump resulted in the assumption that this is the same as *P. atropurpurea.* Another misprint makes the northern *Dryopteris filix-mas* extend south to Va., when Vt. was intended. The lumping of *Dryopteris spinulosa* var. *dilatata* with the eastern *D. campyloptera* naturally leads to a complete misstatement of range here; and there are similar results in the even more complex case of *Athyrium filix-femina.*

Misprints such as those noted in connection with localities are rather frequent throughout. On page 88 Steller is said to have died in 1746 and to have written a book on Kamchatka in 1774; here the dates are correct but the word published should have been inserted before in. The authority on *Isoetes* appears as Englemann, and the botanist of the Department of Agriculture as Colville. The correct spellings in most cases will be obvious to the expert, but the beginner is likely to be somewhat confused. Like the book previously reviewed, this can be classed as a useful work, though not incapable of improvement.

PHILADELPHIA, PA.

Shorter Notes

In response to the request in the July–September FERN JOURNAL, I am glad to submit my modest list of ferns which I have growing and make special mention of my experience with Climbing or Hartford ferns which we have been transplanting from various sources, during the past three or four years, to my location in Petersham, Massachusetts. (The only town, by the way, of that name in the U. S. A.)

So far as I know, they are not native in our vicinity, but seem to have taken very kindly to our soil and environment and so far have flourished to the extent that they seem to prosper better than in the locations from which they were taken. There are in all twenty-six stands or clusters which are climbing on dead sticks and branches, which have been placed conveniently for them, and every lot today is as fresh and green as new spring foliage. On some we found the fertile fronds and are hoping that they will spread round about where they have plenty of room in which to multiply.

Some of these ferns are 32 inches high from ground to tip and are growing under pine trees. They live quite near a pure spring brook, which falls from the hills through a little pond and into a dell where all kinds of wild things grow, like showy ladyslippers, purple fringed orchids, water forget-me-nots, cowslips, various violets, pogonias, and other attractive wild flowers which like wet soil, not forgetting pitcher plants, lovely primroses, buttercups, buck-beans, and the like.

Some of the other ferns which have been arranged as naturally as possible on an attractive trail between brook and hillside list as follows:

English	*Latin*
Berry Bladder Fern	*Cystopteris bulbifera*
Boott Wood Fern	*Aspidium Boottii*

Bracken	*Pteridium latiusculum*
Broad Beechfern	*Phegopteris hexagonoptera*
Chain Fern, Virginia	*Woodwardia virginica*
Christmas Fern	*Polystichum acrostichoides*
Cinnamon Fern	*Osmunda cinnamomea*
Climbing Fern	*Lygodium palmatum*
Common Wood Fern	*Aspidium intermedium*
Crested Shield	*Aspidium cristatum*
Cutleaf Grapefern	*Botrychium dissectum*
Ebony Spleenwort	*Asplenium platyneuron*
Evergreen Wood Fern	*Aspidium marginale*
Fragile Bladder Fern	*Cystopteris fragilis*
Goldie Fern	*Aspidium Goldianum*
Grapefern	*Botrychium obliquum*
Hayscented Fern	*Dennstaedtia punctilobula*
Interrupted Fern	*Osmunda Claytoniana*
Long Beechfern	*Phegopteris polypodioides*
Lowland Lady Fern	*Athyrium asplenioides*
Maidenhair Fern	*Adiantum pedatum*
Maidenhair Spleenwort	*Asplenium Trichomanes*
Male Fern	*Aspidium Filix-mas*
Marshfern	*Aspidium Thelypteris*
Massachusetts Fern	*Aspidium simulatum*
Narrowleaf Spleenwort	*Asplenium angustifolium*
New York Fern	*Aspidium noveboracense*
Oak Fern	*Phegopteris Dryopteris*
Ostrich Fern	*Onoclea Struthiopteris*
Polypody	*Polypodium virginianum*
Redstemmed Lady Fern	
Royal Fern	*Osmunda regalis*
Sensitive Fern	*Onoclea sensibilis*
Silvery Spleenwort	*Athyrium acrostichoides*
Wood Fern, Common	*Aspidium intermedium*

We have 165 or more kinds of wild flowers in the vicinity of the house and have found as many as sixty-eight varieties in bloom during a single tramp.

The total number of kinds of ferns are a little more than 30, the shrubs 16 or more, and number of families of wild flowers 50 or more.—CHARLES L. ALLEN, *Worcester, Mass.*

ISOETES MACROSPORA IN THE SHENANDOAH VALLEY.—While we were guests of Mr. F. W. Hunnewell, the writers explored the river bottoms along Passage Creek, a stream which lies just east of the Massanutten range, which is such a prominent feature of the landscape of

the upper Shenandoah Valley. Among the unusual plants collected on this particular day, July 2, 1933, was an *Isoetes* which grew abundantly in the shallow waters of the creek. This *Isoetes* ran down in the keys to *I. macrospora*, a finding which was substantiated by the late T. Chalkley Palmer, who made the following notes: "I have made a thorough study of this from Frederic Co., Virginia. There are no bast bundles and stomata are scarce or absent. The leaves are *not* those of *I. Tuckermani*. The ♀ spores I find to measure 658–800 μ the ♂ 31–39 μ. Sculpture of ♀ as for *I. macrospora*. The ♂ lack the short spines, the silica of the exospore being not well developed. The sporangium is slightly to distinctly spotted. This last, however, is not fatal, and I am able to confirm your findings of *I. macrospora* so flagrantly out of bounds." This northern species is reported in Miss Pfeiffer's *Monograph of the Isoetaceae*, (Ann. Missouri Bot. Gard. **9**: 193, 1922), as extending from Newfoundland west to Minnesota, the southernmost locality being apparently in the Catskill Mountains of New York. The occurrence in Virginia is therefore an interesting range extension far to the southward.—HENRY K. SVENSON AND LUDLOW GRISCOM.

American Fern Society

Edward Hale Clarkson, for several years an active member of the Society, died at Newburyport, Massachusetts (the place of his birth), Sept. 4, 1934, aged 68. He was for a number of years a jeweler in Boston, but retired from business, while still comparatively young, to devote himself to other interests. He spent much time in compiling a complete record of citizens of Newburyport who served in the World War.

About 1917 he became interested in ferns and for more than ten years thereafter was an earnest student of them and a frequent contributor to the FERN JOURNAL. He had the instinct for original investigation and he was nothing if not thorough. He made a plantation of young trees, brought in bodily, on one side of his door-yard, that the ferns he wished to grow might find congenial surroundings. He experimented, rather successfully, in naturalizing hardy ferns in the country about Newburyport. He discovered one of the two isolated stations in eastern Massachusetts for the broad-leaf wood-fern, otherwise a northern or montane species. He observed and reported on the relative resistance to frost of the native ferns in his garden. His most noteworthy contribution to knowledge, however, was his investigation of rootstock characters in the group of *Thelypteris spinulosa*. In pursuit of it, he studied many individual plants in the field and imported scores of roots of *T. dilatata* from Europe and the Pacific coast of North America, that he might grow and observe them in a living state and under conditions as nearly natural as he could make them. His final conclusion was that four species could be distinguished in the group.

It was a real misfortune to pteridology when failing health compelled him to give up his work.

The financial condition of the Society is much improved; but no access of riches is responsible for the forty pages in this number of the JOURNAL. In order to secure prompt publication, a contributor has paid for the extra pages and for one plate. With the next number, however, it is planned to return to our former 36-page make-up.

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Vol. 25 July-September, 1935 No. 3

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R. C. BENEDICT E. J. WINSLOW

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American Fern Journal

VOL. 25 JULY–SEPTEMBER, 1935 No. 3

Studies on the Spores of some Northeastern Ferns

ROGERS MCVAUGH

During the winter of 1931–1932, while studying the fern-flora of Columbia County, New York, the writer became impressed by the scarcity of published data relating to spore-characters of native ferns. The standard manuals of the flora of the northeastern states make no use of spore-characters in bringing out relationships. Furthermore, fern literature as a whole seems very barren in this respect: Sadebeck, in Engler and Prantl (1902), includes a few spore drawings, but there is no sign that he made any comparative study. D. C. Eaton, in his beautifully illustrated "Ferns of North America" (1893), is equally vague about spores.

The only paper bearing on the above, which has come to the writer's attention, is that of C. B. Weaver (1896), in which he gives rather poor drawings of the spores of 59 species of North American ferns, together with average measurements, presumably in millimeters, of the spores of some 30 specimens. He makes no attempt to point out generic relationships.

While they are not in any sense comparative studies, mention may be made here of Butters' (1917 a) paper on *Pellaea* as well as the (1917 b) paper by the same author on *Athyrium* (see also F. L. Pickett, 1914 and

[Volume 25, No. 2 of the JOURNAL, pages 33–72, plates 3 and 4, was issued June 22, 1935.]

1917). In these papers spore characters are used, among others, as diagnostic ones.

It has accordingly been thought worthwhile to undertake a comparative study of the spores of the ferns native to the northeastern United States, with the idea of determining whether or not spore characters can be relied on as a basis for distinguishing genera or species. Twenty-one genera were studied, including 47 species. The spores were obtained in nearly all cases from dried material in the herbarium of the University of Pennsylvania, at Philadelphia.

It was found early in the study that only in certain cases could different species in the same genus be distinguished by their spore-differences, but in most cases the various genera could be separated by well-marked and seemingly constant characters. It must be remembered that these results were obtained with spores of dried material: we cannot say surely that they can be applied to fresh or living plants. Nevertheless, since in the bulk of the material examined the spores of any given species were found to be practically identical, regardless of the habitat of the plant or the age of the specimen, it is hoped that some value may attach to the characters as determined.

The main spore-differences which can be made use of are as follows: color, size, shape, markings of the exospore, and condition and structure of the perispore (epispore), if present. An artificial key is here appended, which should help the observer pick out the essential points. It is regrettable that in several cases only one species of a genus could be examined, but this is due to the lack of other species in the region under consideration. We are unable to say, for example, that the spore-characters seen in *Adiantum pedatum* are constant for the whole genus.

ANALYTICAL KEY

(The arrangement follows, in general, that of Diels (1902), and Carl Christensen (1905)).

FAMILY 1. POLYPODIACEAE

I. Perispore wanting or appearing as minute scales (A).
  A. Spores smooth or practically so; tetrahedral, somewhat flattened; yellowish, practically transparent. Ca. 25 mu thick by 30–35 mu in diameter.....*Adiantum pedatum* L.
  AA. Spores tuberculate, roughened, scaly, echinate, or ridged (a).
    a. Spores echinate, dark brown, 20–30 × 30–40 mu.
Cystopteris.
The spores of *C. fragilis* tend to be larger, wtih more prominent spines, than those of *C. bulbifera.*
    aa. Spores tuberculate: *i.e.*, covered with wart-like elevations; verrucose; *not* scaly (1).
      1. Spores oblong-oval, bilateral, somewhat kidney-shaped, colorless or light yellow; 30–42 × 48–65 mu .....*Polypodium virginianum* L.
      1. Spores roundish, tetrahedral, usually marked by a tri-radiate line (2).
        2. Projections on spore-wall scanty; present on one side only; spore somewhat flattened, light brown, translucent, 30–35 × 20–25 mu.
Dennstaedtia punctilobula (Mx.) Moore.
        2. Projections covering most of the surface of the spore; spores prominently tetrahedral, somewhat flattened; tri-radiate line conspicuous; yellow-transparent, 30–35 × 40–48 mu.
Cryptogramma Stelleri (S. G. Gmel.) Prantl.
    aaa. Spores variously roughened, generally presenting a scaly appearance; not typically verrucose (3).
      3. Spores small, dark yellowish to nigrescent, 25–32 mu in diameter.
Pteridium latiusculum (Desv.) Hieron.
      3. Spores larger; irregularly round to oval, covered with prominent scales which give them a ragged appearance; not green (4).
        4. Spores round to oval, yellow-brown; scales conspicuous; 45 × 50–60 mu.
Pellaea atropurpurea (L.) Link.
        4. Spores oval to reniform, yellow, with inconspicuous scales; smooth in appearance, 45–60 × 60–80 mu .....*Pellaea glabella* Mett.
        4. Spores round, yellowish, 40 mu in diameter.
Cheilanthes lanosa (Mx.) Watt.

II. Perispore present; sometimes obscure or easily shed; appearing as projections, ridges or wings on the spores (A).
  A. Perispore obscure, inconspicuous; spores smooth or sparingly papillose, yellowish, 24–30 × 30–39 mu.
Athyrium angustum (Willd.) Presl.
  AA. Perispore evident (sometimes not so in *Phegopteris* group) (a).
    a. Perispore loosely attached; often not found in herbarium material, thus giving the spores a perfectly smooth appearance. Spores yellowish to brownish.
Woodwardia.
Spores 35–50 × 40–60 mu.
W. areolata (L.) J. E. Sm.
Spores much smaller..*W. virginica* (L.) J. E. Sm.
    aa. Perispore *not* as a rule so loosely attached (1).
      1. Spores translucent, light greenish-gray, 30–45 × 35–50 mu. Perispore forming a prominent wing; spores noticeably light in color.
Polystichum acrostichoides (Mx.) Schott.
      1. Spores yellowish- or greenish-brown to nigrescent (2).

2. Wrinkles of perispore not forming continuous ridges or wings (3).
3. Spores light brown or yellowish-brown.

Dryopteris (*Phegopteris* group)

*Spores light greenish-brown, to 60 mu long .....*D. Phegopteris* (L.) C. Chr.

Spores greenish-brown, 20–27 × 30–50 mu. *D. hexagonoptera* (Mx.) C. Chr.

Spores light brown, 15–22 × 25–39 mu. *D. Linnaeana* C. Chr.

3. Spores dark brown; protuberances large, smooth, close together; spores 20–27 × 30–39 mu. *Dryopteris marginalis* (L.) A. Gray.

2. Wrinkles of perispore forming what appear to be more or less continuous ridges or wings (4).
4. Spores nigrescent, angular, wrinkled in appearance rather than with a wide wing. Average, 24 × 29 mu. *Athyrium asplenioides* (Mx.) Desv.
4. Spores light or dark brown (5).
5. Folds of perispore forming a wide, conspicuous wing completely around the spore, or nearly so (6).
6. Spores brown, 25–30 × 27–35 mu. *Camptosorus rhizophyllus* (L.) Link.
6. Spores dark brown, usually opaque, with heavy, thick fringes; 35–45 × 45–60 mu. *Pteretis nodulosa* (Mx.) Nieuwl.
6. Spores brown or light brown; ridges sometimes not wholly continuous. *Woodsia.*

Spores brown, 35–40 × 40–50 mu. *W. glabella* R. Br.

Spores light brown, 35 × 50 mu. *W. obtusa* (Spreng.) Torr.

Spores light brown, 30 × 50 mu. *W. ilvensis* (L.) R. Br.

For distinguishing characters, see Figs. 37–39.

5. Folds of perispore forming broken or narrow ridges or wings about the spore (7).
7. Ridges showing a tendency to anastomose; thin rather than rounded or obtuse.

Spores brown, 30 × 35–45 mu. *Athyrium acrostichoides* (Sw.) Diels.

Spores brown, 22–23 × 27–40 mu. *Athyrium pycnocarpon* (Spreng.) Tidestrom.

Asplenium is also to be sought here.

Spores brown, 30–40 × 35–55 mu. *A. Ruta-muraria* L.

Spores brown, 30–40 × 35–45 mu. *A. platyneuron* (L.) Oakes.

The spore of *A. Trichomanes* L. is practically identical with that of *A. platyneuron*; that of *A. montanum* Willd. is slightly smaller; ridges less anastomosing.

---

* *D. Phegopteris* is marked like *D. hexagonoptera*, or ridges may sometimes be formed, as in Fig. 26.

7. Ridges consisting of more or less obtuse or irregular wrinkles and protuberances; anastomosing little or not at all.

**Dryopteris* (subgenus *Eudryopteris* C. Chr.)

Spores brown, 30–40 × 40–60 mu.
D. cristata (L.) A. Gray.
Spores brown, 25–30 × 30–40 mu.
D. Goldiana (Hook.) A. Gray.
Spores 25–35 × 30–44 mu.
D. spinulosa (Muell.) O. Ktze.

Dryopteris (subgenus Lastrea)

Spores brown, 25–30 × 33–45 mu.
D. noveboracensis (L.) A. Gray.
Spores brown, 25–35 × 30–57 mu.
D. Thelypteris (L.) A. Gray.

The spore of *D. simulata* Dav. is brown, similar in size to that of *D. Thelypteris*, but marked like *D. noveboracensis*.

FAMILY 2. SCHIZAEACEAE

Perispore wanting.

A. Spores pitted or pocked; smoothly symmetrical, oval, with many small shallow pits; yellowish-gray; large (45–65 × 60–90 mu.) ..... *Schizaea pusilla* Pursh.

AA. Spores roughened, plainly tetrahedral, yellow-translucent, thin-walled, marked with irregular scattered projections; 50–60 mu diam. ..... *Lygodium palmatum* (Bernh.) Sw.

FAMILY 3. OSMUNDACEAE

Spores globular, green, marked with numerous small irregular flat to spiny projections.

Osmunda

Spores 60 mu in diameter.
O. regalis L. var. *spectabilis* (Willd.) A. Gray.
Spores 40–50 mu in diameter.
O. cinnamomea L. and *O. Claytoniana* L.

FAMILY 4. OPHIOGLOSSACEAE

Perispore wanting.

A. Spores pitted or pocked (a).

a. Spores roughly oval, 30 × 40 mu, marked coarsely with pits. *Ophioglossum vulgatum* L.

aa. Spores roundish or somewhat tetrahedral, 20–25 × 25–30 mu ..... *Botrychium silaifolium* Presl.

AA. Spores tuberculate; *i.e.*, covered with wartlike elevations: verrucose; not scaly. Roundish, with inconspicuous tri-radiate lines.

†*Botrychium*

Spores 35–50 mu in diameter..... *B. simplex* Hitchc.
Spores 25–35 mu in diameter.
B. angustisegmentum (P. & M.) Fern.
Spores 25–35 mu in diameter.. *B. matricariaefolium* A. Br.
Spores 25–35 mu in diameter..... *B. virginianum* (L.) Sw.

---

* The *Phegopteris* group may also be sought here: subgenus *Lastrea* (Bory) C. Chr. See Christensen (1919).

† *Botrychium silaifolium* is to be sought especially under (A). In the other members of the genus, except *B. virginianum*, there may often be noticed in the spores of the same species a series of intergrading forms, varying from the pitted condition to a tuberculate one. The intermediate stages consist of cases in which the knobs or tubercles become extended on the surface of the spore, and finally meet, forming continuous ridges. When this advances far enough it produces the pitted spore: *B. silaifolium* is apparently at the end of a series.

The consideration of the above grouping, together with the plates, brings out several interesting features; spore-characters in general bear out studies of relationships made in other ways.

Let us first consider the *Polypodiaceae,* in which there are seen several groups. The genus *Woodsia* seems a close-knit one, and very similar to the related *Pteretis. Cystopteris,* which is often placed near *Woodsia,* is markedly different in spore-characters, and *Dennstaedtia* seems more closely allied to the Pteroid ferns, such as *Adiantum.*

The Pteroid ferns as a whole, comprising those genera with marginal elongate sori, show similar characters, although variations in size and degree of scaliness indicate looseness of relationships. The considerable differences between *Pellaea* and *Cryptogramma* indicate the reasonableness of their generic segregation, while *Cheilanthes* seems much closer to *Pellaea.*

The spore of *Polypodium,* with its bean-shape, and bilateral symmetry, differs markedly from all others. It is worthwhile emphasizing here that evolution in ferns has been definitely along reticulate lines, and not in a straight chain. The spore of an advanced type such as *Polypodium* has little relation to the spore of the Asplenieae, for example: advancement has been along different lines.

The spores of the *Asplenium* group (sorus elongate; indusium lateral-superior) seem quite uniform. The genera *Asplenium* and *Athyrium* are separated with difficulty, while close similarity of spores seems to favor the retention of *Woodwardia areolata* and *W. virginica* in the same genus. The genus *Camptosorus,* sometimes placed in *Asplenium,* generally shows a more conspicuous perispore "wing" than the *Asplenia.* However, especially in view of its tendency to hybridize with *A. platy-*

neuron, there is a question as to the advisability of maintaining it as a separate genus.

In the last group of the family (*Aspidieae* of Diels (1902); sorus circular, indusium superior or wanting) the spores of *Polystichum* differ plainly from those of *Dryopteris*: the color differs, as well as the markings. The group of *Phegopteris* (subgenus *Lastrea* (Bory) C. Chr.) seems to form a unit differing, by a lighter spore-color and a less wrinkled perispore, from *Dryopteris* as a whole. The peculiar spore of *D. marginalis* is quite easily recognized, and is quite similar to that of the related western *D. arguta*, though smaller. *D. Filix-mas*, on the other hand, seems to be related more closely by spore-characters to the spinulose ferns. The writer has seen a few sheets of the two last, through the kindness of Mr. C. A. Weatherby, but the above conclusions should be tested by further observations. The rest of the comprehensive genus *Dryopteris* would be hard to separate; the three related species, *D. simulata*, *D. noveboracensis*, and *D. Thelypteris* (also subgenus *Lastrea*), are especially closely similar to each other.

Going from the *Polypodiaceae* to the *Ophioglossaceae*, we see signs of family affinity within the latter family. The spores are alike in lacking a perispore, and in the generally pitted or tuberculate character. Within the genus *Botrychium* the various species seem to be related much as Prantl (see Bitter, G. (1902)) arranges them. It is both unnecessary and unwise, however, to place much stress upon these resemblances, without further study.

The present study is admittedly very incomplete. Certain groups, such as the Appalachian *Asplenia*, have hardly been touched; certain genera, such as *Onoclea* and *Polystichum*, have been neglected. *Dryopteris* would repay much more study: the list might be much pro-

longed. It is hoped, however, that this paper will be of interest to students of the ferns, and will stimulate further work to test the correctness of the views herein expressed.

In conclusion, the writer wishes to extend his sincere thanks to Dr. J. M. Fogg, with whose help the work on spores was carried out, and to Dr. E. T. Wherry, who made many helpful suggestions during the course of the work.

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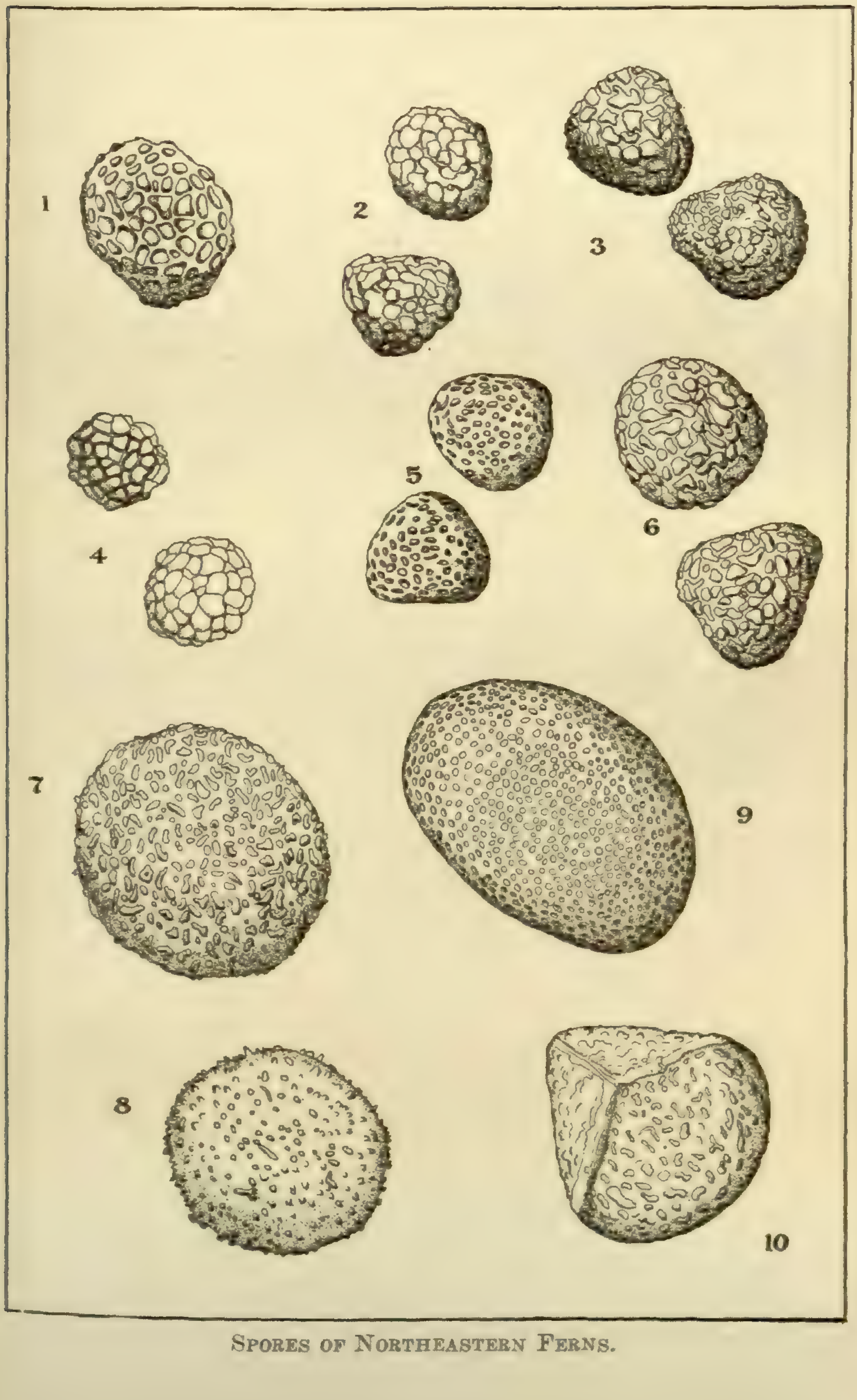
EXPLANATION OF PLATES

The outlines of the figures were made in all cases with the aid of a camera lucida; artificial light was used, with a compound microscope equipped with a #10 eyepiece and a 4 mm. objective. The spores were mounted in water. The figures are enlarged approximately 425 times.

PLATE 5. Fig. 1. *Ophioglossum vulgatum* L.; Fig. 2. *Botrychium angustisegmentum* (P. & M.) Fern.; Fig. 3. *B. matri-*



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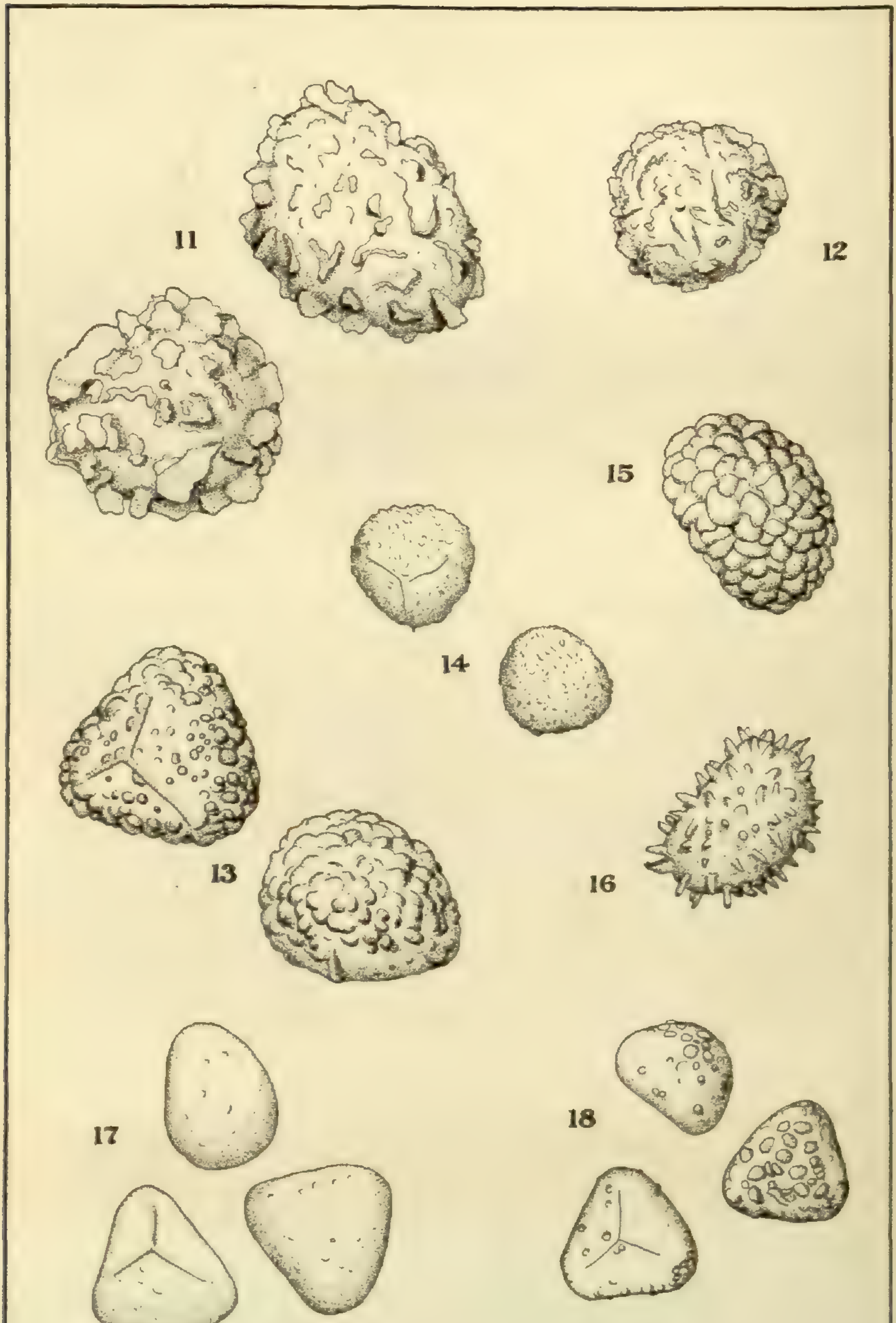

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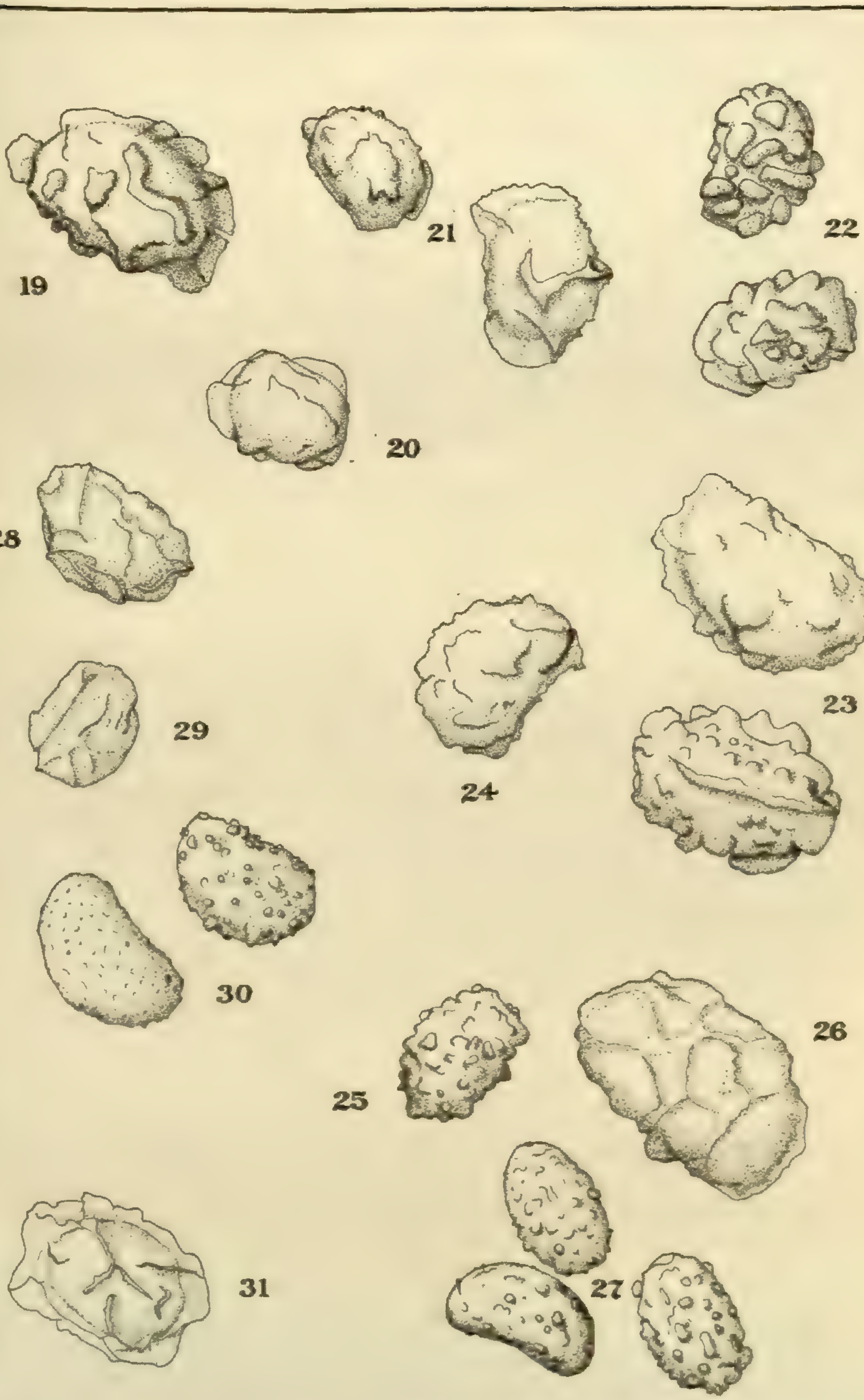

Spores of Northeastern Ferns.

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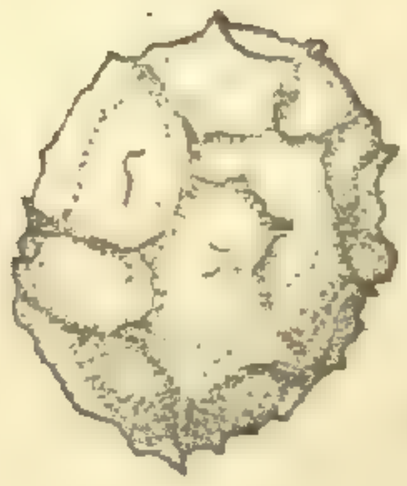

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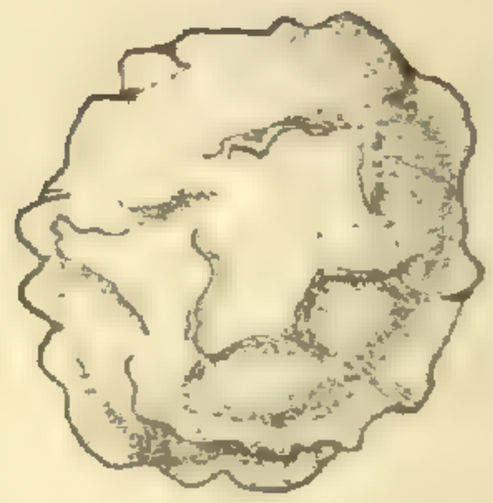

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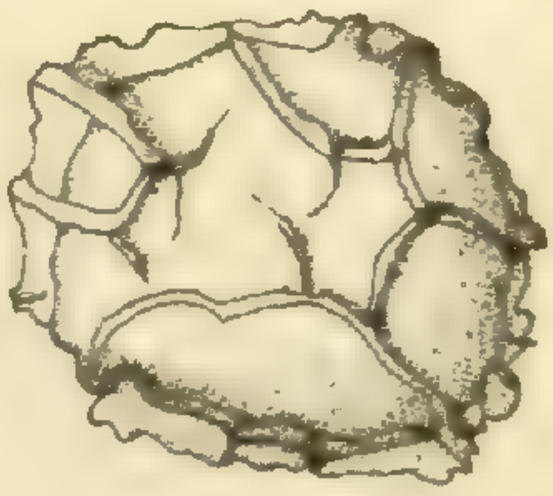

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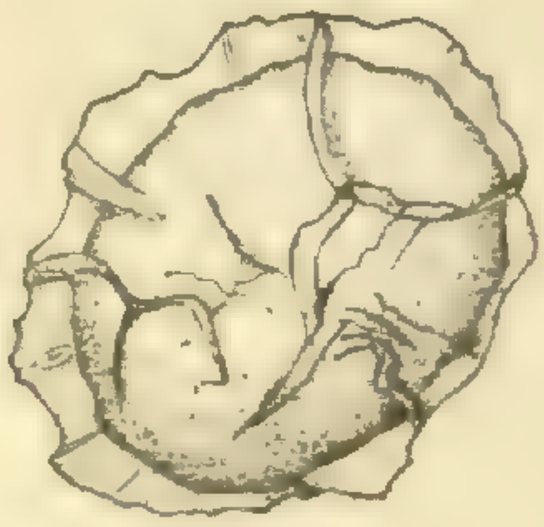

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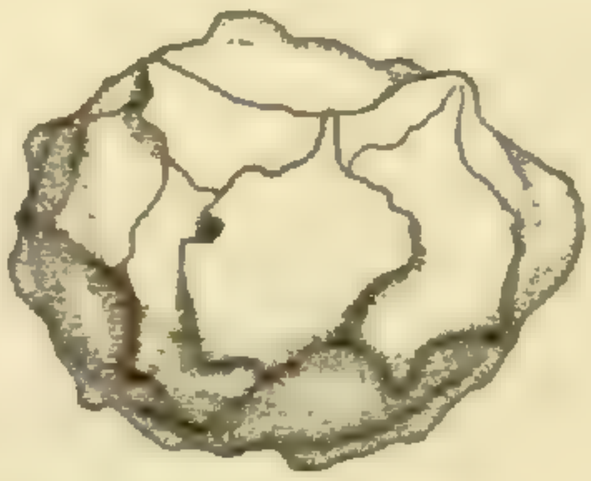

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Spores of Northeastern Ferns.

cariaefolium A. Br.; Fig. 4. *B. virginianum* (L.) Sw.; Fig. 5. *B. silaifolium* Presl; Fig. 6. *B. simplex* Hitchc.; Fig. 7. *Osmunda regalis* L. var. *spectabilis* (Willd.) A. Gray; Fig. 8. *O. cinnamomea* L.; Fig. 9. *Schizaea pusilla* Pursh; Fig. 10. *Lygodium palmatum* (Bernh.) Sw.

PLATE 6. Fig. 11. *Pellaea atropurpurea* (L.) Link.; Fig. 12. *Cheilanthes lanosa* (Mx.) Watt; Fig. 13. *Cryptogramma Stelleri* (S. G. Gmel.) Prantl; Fig. 14. *Pteridium latiusculum* (Desv.) Hieron.; Fig. 15. *Polypodium virginianum* L.; Fig. 16. *Cystopteris bulbifera* (L.) Bernh.; Fig. 17. *Adiantum pedatum* L.; Fig. 18. *Dennstaedtia punctilobula* (Mx.) Moore.

PLATE 7. Fig. 19. *Dryopteris cristata* (L.) A. Gray; Fig. 20. *D. Goldiana* (Hook.) A. Gray; Fig. 21. *D. spinulosa* (Muell.) O. Ktze.; Fig. 22. *D. marginalis* (L.) A. Gray; Fig. 23. *D. Thelypteris* (L.) A. Gray; Fig. 24. *D. noveboracensis* (L.) A. Gray; Fig. 25. *D. Linnaeana* C. Chr.; Fig. 26. *D. Phegopteris* (L.) C. Chr.; Fig. 27. *Dryopteris hexagonoptera* (Mx.) C. Chr.; Fig. 28. *Athyrium acrostichoides* (Sw.) Diels; Fig. 29. *A. asplenioides* (Mx.) Desv.; Fig. 30. *A. angustum* (Willd.) Presl; Fig. 31. *Polystichum acrostichoides* (Mx.) Schott.

PLATE 8. Fig. 32. *Camptosorus rhizophyllus* (L.) Link; Fig. 33. *Athyrium pycnocarpon* (Spreng.) Tidestrom; Fig. 34. *Asplenium platyneuron* (L.) Oakes; Fig. 35. *A. Ruta-muraria* L.; Fig. 36. *Pteretis nodulosa* (Mx.) Nieuwl.; Fig. 37. *Woodsia ilvensis* (L.) R. Br.; Fig. 38. *W. obtusa* (Spreng.) Torr.; Fig. 39. *W. glabella* R. Br.; Fig. 40. *Woodwardia areolata* (L.) J. E. Sm.; Fig. 41. *W. virginica* (L.) J. E. Sm.

BOTANICAL LABORATORY,
UNIVERSITY OF PENNSYLVANIA,
DECEMBER, 1934.

Annotations on West American Ferns--I.

JOSEPH EWAN

All collections cited where the collector's name appears in italics in this and subsequent papers of this series have been examined by the author unless stated contrariwise. The Herbarium of the University of California has been freely consulted. References to the literature not found in the appended bibliography herewith are given in the author's last paper in the AMER. FERN JOURNAL (**24**: 8–9).

To the friends who have materially aided my studies I am sincerely grateful. Dr. H. L. Mason, Assistant Curator of the University of California Herbarium, kindly permitted me to examine the pteridophytes in his private herbarium prior to placing them in the University collections, with the additional privilege of segregating duplicates for my own herbarium. Mr. Edward Lee, colleague at this University, has pointed out fresh trails often forgotten or overgrown to the crannied fern literature. Dr. Carl Epling, Mr. Frank W. Peirson of Altadena and Mr. Louis Wheeler have continued to favor me with herbarium material. By the kindness of Mr. Peirson I was able to check certain collections in his private herbarium.

CHEILANTHES GRACILLIMA D. C. Eaton. This fern is now known to range rather continuously along the Sierra Nevada to Tulare County. Two unrecorded stations located midway between Mariposa County, where it has been long known, and Tulare County, where recently reported by me (1931, 107), are both situated in the drainage of Middle Fork of Kings River, Fresno Co., precisely at Simpson's Meadows, 6000 ft., *Peirson* 2332 in 1913 and Grouse Meadows, 8250 ft., *Peirson* 1505 in 1917. Smiley's (1921, 73) statement of range to include

"southern California" was, I believe, a slip, at present unvalidated by specimens, Tulare County being its southernmost limit in California.

NOTHOLAENA LEMMONI D. C. Eaton. Kearney (1929, 70) has drawn attention to certain relationships between Lower Californian species of flowering plants and closely related or identical species growing in central Arizona. Members of the genera *Maurandya* (*Scrophulariaceae*) and *Colubrina* (*Rhamnaceae*) were pointed out as similarly occurring about midway along the Gulf of California side of the peninsula and in Fish Creek Canyon, northeastern Maricopa Co., Arizona. *Notholaena Lemmoni* among ferns presents a somewhat different but related variant to this problem of plant geography.

First described and long known from Arizonan collections, it may be definitely assigned to the Lower California flora on the basis of four collections from the southern half of the peninsula enumerated below. All these stations fall within the "southern or Sinaloan province" of Johnston (1924, 958), being a somewhat emended phytogeographic concept of Goldman's (1916, 310), and, the first locality excepted, all fall within Brandegee's "Cape Region" (1892, 223) or distribute themselves between the "Cape Sierran" of "Comundú" districts of Johnston (1924, 960). T. S. Brandegee has primly tabulated (1892, 230–231) the relationships of the Cape Region flora with northern Baja California and the mainland of Mexico. Of the 22 Filices credited to the Cape Region, but not there enumerated, all but one (endemic) are also Mexican mainland species. The relationships of the peninsular flora to that immediately to the north, the Californian, has long been recognized and is well summarized by Brandegee (1893, 199 *et seq.*). But an unworked project that should prove provocatively interesting is the tabulation of Arizonan floristic affinities

as an additional column to Brandegee's table. This Arizona-Lower California alliance is a cross-current to the better-known "mexikanisch-kalifornische Xerophytenflora" alliance of Christ (1910, 275). The Sonoran or Mexican mainland relationships to the California flora are generally led forth, often as tributary arguments to a discussion of the derivation of the latter flora, rather than as factors concerning the peninsular relationships meriting special consideration. Mexico is taken to cover the peninsula when the factors are not uniform. Neither Christ, Brandegee nor Johnston draw comparisons between the Baja Californian and Arizonan (as wholly apart from the Californian) floras. Johnston (1924, 963) lists nine species "which range the entire length of Lower California and into California and Arizona" but of these all are known from California as well as Arizona.

I have examined four collections of *N. Lemmoni* from Lower California, all made by T. S. Brandegee, at the following places: Comondu Viejo (lat. 26° 5′), 16 II 1889 (UC); Todos Santos (lat. 23° 27′), 20 I 1890 (UC) (with coll. no. 659—Brandegee rarely gave his collections, extensive as they were, either field or herbarium numbers); Mt. San Lazaro (lat. 23° 12′), 10 X 1893 (UC); San Jose del Cabo (lat. 23° 3′), 10 IX 1890 (UC). Brandegee's record (1889, 214) of this fern from "Purisima" I find unsubstantiated in the Brandegee Herbarium here. Perhaps his material is preserved only in the Eaton Herbarium at Yale. The first three localities often do not appear on atlas maps at hand. For locating these and other Lower California localities I have found Eisen and Vaslit's "Map of Cape Region" (Proc. Calif. Acad. Sci. ser. 2, vol. 5, pl. 73. 1895) clear and detailed. For the entire peninsula the "Map of Baja California" (*ibid.*, pl. 72) compiled by the same workers is excellent.

For frequent reference to the geography of Baja California I have found the "gazeteer [sic] of localities" prepared by Joseph Grinnell (1928, 19) highly useful. Though expressly not intending to be a "general gazateer" this will be found to include most of the localities sought. The latitude figures given above are in all cases *fide* Grinnell. With the increasing refinement of our knowledge of the peninsular flora it seems distinctly desirable to abandon the mere citation of a vacant-sounding locality name and substitute the practice of assigning the plant to a district, oriented further most practicably perhaps by designation of latitude (a practice now being taken up by entomologists and other biologists for citation of locality). Through its five hundred miles (roughly) of latitudinal extent Lower California presents a biologically diverse country, too often considered an extralimital "tail-end" of a more important life area to the north.

OPHIOGLOSSUM ENGELMANNI Prantl. Wherry (1926, 2) calls attention to the inclusion of California in the range of this species as given "in Gray," precisely Gray's Manual, ed. 7, p. 47, 1908. Maxon (1913, 2) has maintained the limits of the species to be Arizona on the west, following the earlier statement (1901, 624) and correspondingly was not concerned with it in his latest summation of the Pacific Coast ferns (1923, 2). Authentic *Lower* California collections are: El Taste, (about lat. 23° 10′), *T. Brandegee* 13 IX 1893 (UC) and Sierra de San Francisquito (about lat. 23° 30′), *T. Brandegee* 18 X 1890 (his no. 671 at UC). I have not yet seen California collections. The species is easily recognized by its cuspidate sterile frond.

"*Ophioglossum nudicaule*" given in Carlotta C. Hall's (1917, 155) check-list as occurring "near San Diego" is *O. californicum* Prantl. Early collections, as Cleve-

land's and Lemmon's distributions, often bear the name "O. nudicaule." See E. G. Britton (1897, 556) where this name appears in synonomy under *O. californicum* as of such San Diegan collections believed to be *O. nudicaule*. For further notes see Munz and Johnston (1922, 12: 119). The only southern California species of Ophioglossum yet discovered, therefore, is *O. californicum* Prantl known from the mesas about San Diego north to Temecula Canyon, Riverside County. Wiggins (1932, 36) records notes of interest on this plant.

OPHIOGLOSSUM VULGATUM L. E. G. Britton (1897, 553) was apparently the first botanist to report this species for California. In her general introduction she commented, "Blasdale has collected what appears to be this species in California" and within the description of the species merely noted "also in California." Underwood (1900, 67) repeated the last phrase without comment when giving the range. Gilbert (1901, 12) lists "Cala." by name only. Maxon (1901, 624) gives only Britton's original phrase, "also in California." Parish (1904, 4) first questioned the California record as follows: "*Ophioglossum vulgare* L. [*sic*]—A specimen of this species is said to have been collected somewhere in California, but its authenticity is doubtful." Subsequently by an examination of a specimen at the University of California Mrs. Hall was able to reinstate this plant in her check list (1917, 155), adding the locality "Siskiyou County" for she had discovered the Blasdale collection here. The sheet bears an annotation label in Mrs. Britton's hand, as follows: "these fronds are young and the venation obscure but appears to be unequal with 1 fine (? as to my deciphering) veinlet. Not unlike *O. vulgatum* but broader—spores .030–.040, reticulated with raised ridges." The original herbarium (form) label reads "*Ophioglossum vulgatum* L. In open swamp

near Sisson, Siskiyou Co., July 25, 1894. Small form. *W. C. Blasdale.*'' Sisson is a town at an elevation of 3550 ft. (now called Shasta City—on the Klamath Natl. Forest Map, 1921—or Mt. Shasta—on Shasta Natl. Forest Map, 1927—the latter place name for the town should be suppressed!) The Blasdale collection may be considered this species until more material comes to hand. Of the three fronds on the sheet the blade of the largest is broadly ovate, rounded at apex, 45 × 20 mm., of the characteristic *vulgatum* aspect, but as Mrs. Britton pointed out it is ''broader'' than usual. There is no other California collection in the University of California Herbarium—Collectors! *verbum sapienti.*

PELLAEA FLEXUOSA (Kaulf.) Link. Upon a misdetermination of what was most likely *Pellaea andromedaefolia* momentum was given to a report of *P. flexuosa* for California which recurred in the literature until 1917, thirty-nine years after the mistake was made by D. C. Eaton. In the Ferns of North America (p. 208, 1878—for the date *cf.* Rhodora **20**: 75) Eaton gave the range of *Pellaea flexuosa* as ''from Austin, Texas, to San Diego County, California,'' without mention of collections specifically. However, he dropped California from the range in his conspectus, ''Ferns of the Southwest'' (1879, 324) and added a sentence which accounts, I believe, for his earlier statement: ''occasionally there are large-pinnuled plants of *P. andromedaefolia* . . . which bear a considerable resemblance to the present species.'' The Botany of California appeared the following year with Eaton's clear pronouncement: ''occurs in Arizona and may yet be discovered in the southern part of California'' (1880, 341). Neither Jones' nor Lemmon's annotated lists of west American ferns appearing two years later carried California records for this species. Underwood (1900, 101) notwithstanding exhumed the

California record and Maxon (1901, 634) and Gilbert (1901, 18) sustained Underwood's statement. Parish, aware of these records, was decidedly skeptical of their validity and wrote (1904, 9) to the effect that although "—Pellaea flexuosa Link. has been credited to California, . . . the reference is almost certainly erroneous." To the best of my knowledge this San Diego County record appeared for the last time in Carlotta C. Hall's check list (1917, 157). No mention of this old record has appeared in the three accounts expressly concerning the ferns of that county, *viz.* Kimball (1911), Wiggins (1932) and Cota (1933). Parish's conclusion stands and that *Pellaea flexuosa* will ever be discovered a member of the California fern flora is further highly improbable. Bearing in mind the nature and composition of the floras of Arizona and California there comes a definite sense of what may and may not be expected in either flora as a contribution from the other. Such a Middle-American element as this fern is very unlikely to appear in California. Any collection which may be located in Eastern herbaria labelled as this species should be carefully scrutinized and even should it prove to be *P. flexuosa* a confusion of labels is to be certainly considered a likelihood.

When *Pellaea andromedaefolia* grows in a more protected situation, as beneath shelving rocks, the pinnules become unusually large and more orbicular in contour—"more herbaceous" and often unlike the familiar xerophyte commonly met with. It is this ecological phase, which Moxley (1915, 107) described as *P. rafaelensis* (subsequently discussed by Maxon (1916, 67) and believed to be an ecological variant of the common species of the southern California foothills), which most probably was named by Prof. Eaton, at a time when far less was known of the range of normally expected variation

in our southwestern ferns, *Pellaea flexuosa*. This record must be relegated, along with that of *Adiantum tricholepis* from Monterey and others, to the hypothetical list of California ferns.

POLYPODIUM SCOULERI Hook. & Grev. Although the reference was at hand I recently neglected to mention Parish's paper (1901) on the occurrence of "characteristic" *Polypodium Scouleri* on Santa Cruz Island. Parish received the *Yates* August, 1893, collection (a duplicate sheet of which I examined at the Los Angeles County Museum) and concluded that it constituted valid material, though "smaller than most mainland specimens" from more northern localities.

POLYSTICHUM ————————? In the study of tropical floras the investigator must often be content to learn the characters of the plants before him from few and fragmentary collections, representing plants which furthermore may not again be detected for decades or, as with the peculiar burmanniads of Amazonas, indeed not so far rediscovered. In these instances the publication of a species as new on the basis of a single collection is justified, whereas with the fern flora of Washington state one would incline, at this advanced stage in its investigation, to hesitate seriously at such a procedure. A collection, unique in my experience, made at Liberty Lake, Spokane Co., Washington, near the Idaho state line, by *A. M. Johnson* 11 V 1913 (UCLA) has a polystichoid indusium (nearest *P. munitum*) and the habit and segmentation suggestive of *Dryopteris oreopteris* lacking the pinnatifid character of that species. It is unlike *Polystichum Andersoni*. More material from this locality may show it to be an outlying form of some well-known fern.

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A List of Varieties and Forms of the Ferns of Eastern North America

(continued from p. 51)

OPHIOGLOSSACEAE (cont.)

BOTRYCHIUM MULTIFIDUM (Gmelin) Ruprecht, Beiträge zur Pflanzenkunde des russischen Reiches **11**: 10 (1859). *Osmunda m.* Gmelin, Novi Commentarii **12**: 517 (1768). (*B. matricariae; B. ternatum*, var. *rutaefolium*).—Sterile blade usually not over 3 inches long, with the secondary divisions and the usually crowded ultimate segments tending to be broad and obtuse. Found in northern Europe and Asia, northern New England, adjacent Canada and west to Wisconsin. In Europe the only form; in America passing by every conceivable gradation to the following.

Var. INTERMEDIUM (D. C. Eaton) Farwell, Report Michigan Academy Sciences **18**: 87 (1916). *B. ternatum*, var. *australe*, subvar. *i.* D. C. Eaton, Ferns of North America **1**: 149, pl. 22A (1879).—Larger, the ultimate segments not crowded, tending to be narrowly ovate or even oblong and often acute. Mostly more southern than the preceding, but extending across the continent to northern California, thence north to Alaska.

Although these two freely intergrading variants have been treated as species, they have never been clearly distinguished except on the very unsatisfactory basis of size; it is doubtful if they are more than states of the same thing induced by more or less favorable conditions of growth. *B. obliquum matricarioides* Gilbert, Fern Bulletin **11**: 99 (1903) is only a renaming of *B. matricariae* Schrank. *B. multifidum*, var. *australe* Farwell, l. c., applies to large individuals of var. *intermedium;* the name *australe* properly belongs to an Australian plant and should not be used for any American form. *B. multifidum*, var. *dichotomum* Farwell, l. c., fig. 13, is an abnormal branched condition, with two large fruiting panicles and one small one and a much dwarfed sterile blade.

BOTRYCHIUM VIRGINIANUM (Linnaeus) Swartz, Schrader's Journal for 1800, part **2**: 111 (1801). *Osmunda v.* Linnaeus, Species Plantarum 1064 (1753). In Rhodora **19**: 207–216 (1917) Prof. F. K. Butters published a detailed study of varieties of this species. His key, so far as it applies to the plants of eastern North America, is here given with his statements of the ranges of the varieties interpolated.

A. Ripe sporangia straw-colored, opening but slightly in dehiscence, their walls composed of regular cells. B.
  B. Sporangia 1–1.8 mm. long; segments of sterile frond overlapping. Newfoundland to Labrador, Maine and Michigan. var. *laurentianum* Butters
  BB. Sporangia 0.5–0.8 mm. long; segments of sterile blade not overlapping. Nova Scotia and New England to Illinois and Missouri. var. *intermedium* Butters

AA. Ripe sporangia brown, opening rather widely in dehiscence, their walls composed, at least in part, of irregular cells with sinuous walls. C.
  C. Sporangia not over 0.8 mm. long, dark brown, concolorous, their valves recurved in dehiscence.
    B. virginianum (typical)

CC. Sporangia 0.7–1.2 mm. long, their valves light brown with darker margin, usually not recurved in dehiscence. Quebec and New Hampshire to British Columbia; also in Europe, where rare.

var. *europaeum* Ångström

I have to confess that of these, var. *europaeum* Ångström, Botaniska Notiser (1854) : 68, is the only one I can clearly make out and that I suspect the color and degree of gaping of the sporangia is merely a matter of age. I should prefer to unite vars. *europaeum* and *laurentianum* and merge var. *intermedium* with the typical form. The single variety thus set up would be distinguished by its less dissected, comparatively thick and firm-textured sterile blade and by its generally large sporangia.

Var. *gracile* (Pursh) Lawson, Edinburgh New Philosophical Journal, new series, **19**: 284 (1864), is, as D. C. Eaton long ago pointed out, only a juvenile or depauperate state.

OPHIOGLOSSUM VULGATUM Linnaeus, Species Plantarum 1062 (1753).—Sterile blade at or above the middle of the stalk, sessile, oblong, ovate or oval.

F. PSEUDOPODUM Blake, Rhodora **15**: 87 (1913).—Sterile blade narrowed below to a stalk-like base $\frac{1}{4}$ to $\frac{2}{3}$ as long as the blade proper.

F. LANCEOLATUM (Clute) Blake, l. c. *O. v.* var. *l.* Clute, Fern Bulletin **19**: 72 (1911).—Similar, but the narrowed base greatly elongated, more than twice as long as the blade proper.

F. ARENARIUM (E. G. Britton) Clute, Our Ferns in their Haunts, 316 (1901). *O. a.* E. G. Britton, Bulletin Torrey Botanical Club **24**: 555, plate 318 (1897).—Sterile blade narrowly lanceolate, borne below the middle of the stalk.

Of the above, f. *lanceolatum* is probably a response to conditions of growth—the attempt of the plant to raise its leaf into the light when growing among tall grasses.

F. *arenarium*, though described under various names by several botanists in America and Europe, is regarded by both Clute and Blake as only a starved condition. *F. pusillum* (Raf.) House, Bulletin New York State Museum **243–244**: 42 (1923), is also, on Dr. House's testimony, a still more starved or perhaps a juvenile state. It has a tiny sterile blade often less than ½ inch long and ¼ wide.

OSMUNDACEAE

OSMUNDA REGALIS Linnaeus, Species Plantarum 1065 (1753).—Fertile pinnae without leaf-tissue; rachis of fruiting panicle with numerous black hairs. European; not in America.

Var. SPECTABILIS (Willdenow) Gray, Manual, ed. 2: 600 (1856). *O. s.* Willdenow, Species Plantarum **5**: 98 (1810).—Fruiting panicle terminal, without leaf-tissue, almost without hairs; pinnules rather far apart, oblong-oval to lance-oblong, not lobed except sometimes for a small basal auricle.

F. ANOMALA (Farwell) Harris, Rhodora **35**: 352 (1933). *O. r.* subvar. *a.* Farwell, American Midland Naturalist **12**: 307 (1931).—Fertile pinnae irregularly distributed, often only incompletely fertile.

F. LINEARIS Clute, Fern Bulletin **17**: 10 (1909).—Pinnules linear, conspicuously auricled and with wavy margins; fertile panicle partly leaf-like and with sporangia borne in loose clusters, simulating sori, on the under surface.

F. ORBICULATA Clute, *op. cit.* **14**: 115 (1906).—Pinnules crowded, circular in outline or heart-shaped.

OSMUNDA CLAYTONIANA Linnaeus, Species Plantarum 1066 (1753).—Blade broadly lanceolate; pinnae with numerous, closely contiguous, ovate to oblong, entire pinnules all in one plane.

F. DUBIA (Grout) Clute, Fern Bulletin **13**: 119 (1905). *O. C.* var. *d.* Grout in Gilbert, List North American Pteridophytes 28 (1901).—Pinnules widely separated, the outer elongated and regularly pinnatifid with several pairs of lobes.

F. Mackiana Kittredge, American Fern Journal **12**: 57, pls. 3 & 4 (1922).—Blade narrowly lanceolate, the upper pinnae not over 2 in. long, their pinnules few, more or less triangular, spreading in different planes and often with 1–3 irregular lobes.

Osmunda cinnamomea Linnaeus, Species Plantarum 1066 (1753).—Fertile and sterile fronds quite distinct; segments of sterile pinnae entire, oblong, crowded, not over $\frac{1}{4}$ in. wide, usually 15 or more pairs, glabrous, rather thin and translucent; wool of stipes, etc., pale brown. *F. angusta* Clute, Fern Bulletin **17**: 12 (1909), with somewhat remote, short, triangular segments, is regarded by Blake as an abnormality not worth recognition.

F. auriculata (Hopkins) Kittredge, Bulletin Connecticut State Geological and Natural History Survey **48**: 12 (1931). *O. c.* var. *a.* Hopkins, American Fern Journal **1**: 100 (1911).—Basal segments on the lower side or rarely on both sides of each pinna much elongated and deeply and sharply toothed, other segments normal, or nearly so.

F. incisa (J. W. Huntington) Gilbert, List North American Pteridophytes 13, 28 (1901). *O. c.* var. *i.* J. W. Huntington, Fern Bulletin **7**: 12 (1899).—Segments, or most of them, acutely toothed or lobed.

F. bipinnatifida Clute, Fern Bulletin **15**: 17 (1907).—Similar to the preceding, but the teeth or lobes obtuse.

F. latipinnula Blake, Rhodora **15**: 155 (1913).—Segments somewhat triangular, nearly an inch broad, only about 10 pairs.

F. cornucopiaefolia Clute, Fern Bulletin **16**: 108 (1908).—Midrib of pinnae naked for some distance below tip; many segments bearing clusters of sporangia on naked veinlets which arise from the lower surface.

F. frondosa (Torrey & Gray) Britton, Catalogue Plants of New Jersey 312 (1890). *O. c.* var. *f.* Torrey & Gray in Torrey, Annual Report State Geological Survey New York **4**: 190 (1840).—Fertile frond partly leafy, the fertile and sterile pinnae variously intermixed.

Var. glandulosa Waters, Fern Bulletin **10**: 21 (1902).—Segments and upper part of rachis glandular-pubescent. Rhode Island to Maryland.

Var. IMBRICATA (Kunze) Milde, Monographia Generis Osmundae, 95 (1868) (as defined by Fernald, Rhodora **32**: 75 (1930)). *O. i.* Kunze, Farnkräuter, **2**: 29, pl. 112 (1849).—Segments rather thick, opaque; wool brown or reddish. Tropical and subtropical portions of the southern States.

(To be continued)

GRAY HERBARIUM,
CAMBRIDGE, MASS.

Recent Fern Literature

The appearance of the third supplement to Christensen's Index Filicum is an event of high importance to all students of ferns (though perhaps only the professional taxonomist can fully appreciate the immense usefulness of the work), and a cause of congratulation to them as well as to the author.

Like the other parts of the Index, this is a very thorough, careful and (backed as it is by Dr. Christensen's long experience and expert knowledge of ferns) intelligent and authoritative bibliography. It covers the years 1917 to 1933 inclusive, bringing the record to within a few months of the date of issue (Oct., 1934). In its clear typography and general format it is like the earlier supplements; it is unlike them in that corrections, in them placed in a separate section, are here inserted in their proper alphabetical places along with newly recorded names—an arrangement which makes for convenience. It also has what the other supplements did not have—a revised systematic list of genera, in which the results of recent studies are taken into account.

Few of the resultant changes affect the names of ferns of the United States; some, which have been pretty generally adopted here, are not taken up. For instance, *Matteuccia* Todaro (1866) is retained in place of *Pteretis*

Raf. (1818). The reason for this is not obvious. *Pteretis* was proposed as a substitute for *Struthiopteris* Willd., which is rendered illegitimate by two earlier uses of the name. Rafinesque, to be sure, apparently did not know that Willdenow's name was untenable and rejected it for purely philological reasons; but since it *was* illegitimate his substitute should, it would seem, be accepted, regardless of his motives in putting it forward.

Dryopteris is, reasonably enough, retained in place of *Thelypteris*, because of majority usage and because of the great number of new combinations which the adoption of the latter for the whole huge genus would require—combinations, moreover, which would be only temporary if the genus were to be divided, as Dr. Christensen believes it should be and will be.

Following general American usage, *Tectaria* is taken up in place of *Aspidium* (of the Index, not of Gray's Manual, which is equivalent to *Dryopteris*). *Phyllitis* is still ascribed to Ludwig (1757); it was actually first published by Hill, British Herbal 525 (1756). His publication is not only a year earlier than Ludwig's, but is much clearer, the hart's-tongue being mentioned and illustrated as the sole species of the genus, whereas Ludwig has only a general statement which might apply to almost any simple-leaved fern. *Bommeria*, typified by *B. pedata* and including *B. hispida* of the southwestern United States, is segregated from *Gymnopteris* of the original Index.

The order of genera shows a number of changes in detail, though the main groupings of the Dielsian arrangement are retained.[1]

Señor Looser has investigated the identity of the hitherto doubtful *Gleichenia Bibreae* Mett., which he consid-

[1] Christensen, C. Index Filixum Supplementum tertium pro annis 1917–1933. Hafniae, Oct., 1934. 219 pp.

ers to be the same as *G. quadripartita*. He adds a clear and excellent little synopsis of the four species of *Gleichenia* known to occur in Chile, with critical comment and citation of specimens.[2]

SOME MISLEADING MAPS OF FERN-DISTRIBUTION.—The making of maps showing the distribution of native plants is a fascinating occupation, but unless based on trustworthy data, such maps should not be published. A recent article on fern culture[3] includes a series of maps evidently based on the generalized statements of range in manuals compiled a generation ago, and these give such a misleading idea of the actual ranges in several cases that some comment on them seems necessary.

"*Asplenium filix-femina*—Lady fern." The context shows that the studies described were made on the northeastern Upland Lady fern, *Athyrium angustum;* the cultural data are accordingly not applicable to the Lowland Lady fern, *A. asplenioides*, nor to the western Lady fern, *A. filix-femina*. The range shown is a composite of these three, but omits Florida, where the second grows, and New Mexico, Colorado, Wyoming, Idaho, and Alaska, where the third is well known, as shown by local floras. On the other hand, the dots extend across the plains of southern Canada, where none of the three is recorded.

Dicksonia punctilobula; now placed in the genus *Dennstaedtia*. Known in Arkansas, but not shown there on the map.

Onoclea sensibilis. Grows in Texas, from which the map excludes it.

"*Pteris aquilina*—Brake." Shown as ranging practically throughout North and Central America, but this

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[2] Looser, G. Sobre Gleichenia Bibreae y sobre las Gleicheniaceas chilenas en general. Revista Universitaria **19**: 761–775, pl. 1934.

[3] American ferns—how to grow and use them. Edith A. Roberts. Nat. Hort. Mag. **14**: 105. 1935.

range actually represents three or four species, and the cultural directions apply only to the northeastern one, now generally known as *Pteridium latiusculum*—Bracken.

Asplenium platyneuron. Shown to range throughout the Great Plains, where it is unknown, also too far north of Lake Superior but not far enough south in Florida.

A. trichomanes. Mapped in many regions where absent, such as Florida, the coastal portions of Gulf states, the Great Plains and southwestern deserts, southern California, Labrador, etc.

"*Polypodium vulgare.*" Now classed as *P. virginianum*, to which the cultural directions apply. Known beyond the range shown in several states.

Woodsia ilvensis. Shown as ranging much too far south, to central Georgia, whereas it is not known south of Ashe, a north-border county of North Carolina.

Polystichum acrostichoides. Known considerably beyond the range shown, in all directions.

It seems a pity that the money wasted on publishing such meaningless maps could not have been available for the compilation of some accurate information as to where our ferns really grow.—EDGAR T. WHERRY, *Philadelphia, Pa.*

The genus *Diellia* is one of many groups of plants which are found only in the Hawaiian Islands. Some eight species have been described; but they show so much variation in leaf-form and are so rare and represented by so little material in herbaria that their validity, and indeed the proper systematic position of the genus as a whole, are still in doubt. Miss Smith has found the attempt to align them discouraging. Only three of the eight species have been at all freely collected or can still be found and they show great variation, much of which

Miss Smith believes due to ecological responses. She thinks the genus is dying out; its problems may never be settled.[4]

Shorter Notes

HOW TO TELL WOODSIA OBTUSA FROM CYSTOPTERIS FRAGILIS.—In a former article in the FERN JOURNAL I questioned the worth of indusium characteristics—"star-shaped"—as the most satisfactory detail for separating *Woodsia obtusa* from *Cystopteris fragilis*. This frequent use of the indusium in fern "keys" had led me to wonder if there is something sacred about the indusium and if it really is the genetic key to variations, or whether, after the fable of "star-shaped indusium" had been invented by some astronomical pteridologist, later authors did not take the trouble to question its validity. For many fern lovers the indusium is as inscrutable as a violet's beard.

In that article I said that *Woodsia obtusa* could be separated from *Cystopteris* by the "hairs" on the stalks. These "hairs" are really small scales about 2–4 mm. long and less than 1 mm. wide. They are sparsely scattered along the entire stipe. These are so evident that microscopic examination is unnecessary. With the use of a small hand lens it can also be distinguished from *C. fragilis* by what look like tiny hairs on the stipe, but which, Mr. Weatherby tells me, are "stipitate glands."

In "How to Know the Ferns" Mrs. Parsons says of these ferns, "difficult to distinguish were it not for the difference in the indusium." The key to the Woodsia in the "Fern Lover's Companion" separates *W. obtusa* with "fronds without hairs." Although this is true if one is keen enough to distinguish between "stipitate

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[4] Smith, Frances Grace. Diellia and its Variations. Occas. Papers Bernice P. Bishop Mus. **10**, no. 16: 1–22, 7 pls. 1934.

glands'' and ''hairs,'' it is a misleading key characteristic. Even the key to the 7th edition of Gray labels *W. obtusa* ''fronds never chaffy.'' In the glossary of this book, ''chaffy'' is defined as having ''dry minute scales,'' exactly what is seen on the stalks of this fern.

With such unsatisfactory and unreliable descriptions of this fern, I again question the continuance of this fallacy of the difficulty of separating it from *C. fragilis*, and statements that the best means for identification are indusium characteristics. Most popular handbooks for ferns have been written by people with great enthusiasm who have, however, been obliged to rely for description on authority long ago found erroneous. If one could only slip Waters' fern book into his pocket, it would make a most satisfactory guide, although his ''stipe characteristics'' are not definite enough in many cases for popular use. What a priceless treasure would be a fern book like the ''Field Book of American Wild Flowers'' by F. Schuyler Mathews, who is both an accurate author and an enthusiastic naturalist!—W. L. DIX, Trenton, N. J.

FURTHER NOTES ON THE HART'S TONGUE.—During the past three years I have been watching some of the central New York colonies of *Phyllitis Scolopendrium*, and have been dismayed to note their gradual depletion. The last of the Green Lake station was wiped out by the activities of the Solvay Company during the spring of 1934. That at Chittenango Falls has suffered considerably. When I first visited it in 1931, the rocky slope down which the trail passes on the west side of the gorge was dotted with luxuriant plants. Last November, in company with Dr. William F. Langworthy, my colleague emeritus, William H. Jones, one of my students, and his father, I attempted to show the station to Mr. S. Fred Wright, a visiting fern

enthusiast. To my chagrin, the Hart's Tongues on this rock slide had practically vanished. Careful search by all the members of our party revealed only four or five plants, all in poor condition. We continued down the gorge and found that the talus below the exposed cliff that faces the stream about a hundred yards beyond the descending trail still harbored a considerable number of plants, perhaps fifty in all. Many of these, however, were also in poor condition, with only a few short fronds still green, and many withered ones about the base of the plants.

The sad reduction in numbers of this famous fern at this equally famous locality is due, I believe, to two causes. In the first place, the summers of 1933 and 1934 were both abnormally dry. Scolopendrium, fond as it is of cool, moist climates, was probably the first species to suffer, and the appearance of most of the plants indicated that many of the fronds had recently withered. Secondly, the C.C.C. camp at the falls has undertaken to beautify the gorge, and in doing so has removed underbrush and small trees from about the Hart's Tongues, exposing them to more light and heat than ever. We can only hope that favorable weather and freedom from human molestation in the summers to come will save this famous station.

Last October, while gathering Walking Fern and Narrow-Leaved Spleenwort in a small ravine just north of Stockbridge Falls, Munnsville, I was surprised to come across two plants of Scolopendrium. I do not know whether or not these were transplanted here from the Jamesville station. If so, they are doing very well in their new home. If not, the natural range of the Hart's Tongue in Central New York can be extended eastward about twenty miles.—G. LEDYARD STEBBINS, JR., Colgate University.

American Fern Society

The following extract from a letter to one of the editors should interest our members:

"I have been collecting for a number of years and have about 120 of our 140 varieties growing. My garden is only a hobby, and as some of the ferns require special conditions I have not brought them in yet—namely, the Hymenophyllums, which require Wardian case conditions where I live near the sea and where we have very dry, hot summers. Mt. Egmont, an 8000-foot mountain, is only 20 miles away by a good tarred surface road, and in the dense rain-forest around its base the Hymenophyllums and Trichomanes flourish by the square yard. I have the tree ferns growing freely. Aspleniums of all varieties and many divergent forms do very well in a patch of hand-planted native bush.

"Collecting our native ferns has become very popular of recent years and quite a lot of people have made dug-outs and bush houses and have some fine collections.

"I have about 20 exotics growing in a glass-covered dug-out, including many of the Adiantums and various Australian and English species, etc.

"In writing to you I wonder if it would be asking too much to mention this to some fern enthusiast who is not too busy and get him to make up a parcel of dried fertile fronds of some of your easy-grown American ferns and post to me to have a try at raising them. On the damp banks in my dug-out a lot of the ferns come away spontaneously, especially the Adiantums, so I think ferns of your climate would germinate freely under a piece of glass. . . . I make many happy exchanges and should be pleased to exchange any of our native ferns with some of your growers."—L. S. Mackie, Otakeho, Hawera, Taranaki, New Zealand.

Mrs. Y. C. Lott, 1718 s. w. 23rd St., Miami, Florida, would like to exchange ferns with other members.

On Sept. 15 there will be a joint Fern Society-Torrey Botanical Club field trip to Springdale, near Newton, New Jersey, led by Dr. Benedict. The locality is reached by automobile via route 6 to Netcong, thence route 31 to Springdale. Party will meet there at 10 A. M. Swamps in the vicinity and along the railroad north of Newton will be explored.

Will members who can offer transportation for this trip send word to Dr. Svenson or Dr. Benedict how many extra passengers they can accommodate? Also, will members who would like to apply for transportation make known their wishes similarly?

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R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

VOL. 25 OCTOBER–DECEMBER, 1935 No. 4

Describing Botrychiums

E. W. GRAVES

The Botrychiums seem to present one of the most complex problems that we have to deal with in the ferns, so many different views are held concerning the many species and varieties. In corresponding with one authority on American ferns, I received this statement regarding *Botrychium:* "I am sorry that I am not able to reply more definitely to your questions; but, as you know, the group is one of very great difficulty, in which specific lines are not sharply drawn or, at least, are subject to highly varied interpretations by students of the group. As a matter of fact, we have a great deal of material from the northeastern United States that is difficult to place satisfactorily."

A few years ago a discussion was started in the JOURNAL as to whether *B. dissectum* was a valid species, and whether its spores would grow or not. Several were willing to admit the fact that the spores would grow, but few would acknowledge it as a valid species. In my investigations I have found that the spores of *B. dissectum* do grow here at the Bentonsport station and do produce true *B. dissectum* plants, yet I am sure that in the minds of some the question remains unsettled.

There was a time when our ternate Botrychium group was known as *B. lunarioides* Sw. Later the name was

[Volume 25, No. 3 of the Journal, pages 73–108, plates 5–8, was issued August 19, 1935.]

changed to *B. ternatum* Sw. More recent authors have divided the group into two subgroups, as *B. ternatum* var. *intermedium* and *B. obliquum* with several varieties. Some authors have used the name *B. silaifolium* Presl for the former. Rather recently Mr. Farwell has taken up the name *B. multifidum* var. *intermedium* for the plant formerly called *B. ternatum* var. *intermedium*. Perhaps students will eventually drop out the term *multifidum*, as it appears not unlikely that the "variety" will be considered a valid species, since it reproduces itself freely both in large colonies and as scattered individuals widely separated from typical *B. multifidum*. Perhaps also the same will be true of var. *oneidense*, in time. I am informed that in certain localities *oneidense* is found growing in fair-sized colonies.

Prof. W. L. Dix, who spends his summer vacations at Lake Shehawken in the mountains of northeastern Pennsylvania, has made there a considerable collection of the Botrychiums, which he kindly lent me for study. He has found var. *oneidense* to be the most common *Botrychium* there. He reports *B. obliquum* as rare and *B. dissectum* as not found there by him at all. In his collection from that region *B. multifidum* var. *intermedium* is not represented.

In the last few years I have studied *Botrychium* critically, using both living plants and herbarium specimens, and of late have been compelled to change some of my former views. For a long time we accepted the identification of a plant found in the northeastern United States as *B. ternatum* var. *intermedium* D. C. Eaton, regarding *B. ternatum* (Thunb.) Sw. as found in Europe and possibly in Canada. But in 1910 one authority made the statement that *B. ternatum* is not found in America, and in recent correspondence with another specialist on ferns I have been informed that *B. ternatum* is not found

either in Europe or in America, and that the plant which we took to be *B. ternatum* is in reality *B. multifidum* (Gmel.) Rupr.; also that the variety should be called *B. multifidum* var. *intermedium* (D. C. Eaton) Farwell.

After examining many specimens I too feel that we have nothing in America that I would refer to *B. ternatum* (Thunb.) Sw.; that is, in all the material I have examined, and I have had access to many specimens from Canada, Alaska, Washington, and the northeastern states, and some also from Europe and Asia. I shall here make an effort to describe some of the species and varieties in a way that may help students to identify their finds in this group. It is hoped that the illustrations may be of assistance also.

In treating the subject I shall deal only with members of the *ternatum* group, and shall consider only those of the eastern United States. I am aware that some of my conclusions will not be received by all; that some will still claim that most of this group should be classed under *B. silaifolium* Presl, and that others will continue to call them varieties of *B. ternatum*. But it seems logical that, if *B. ternatum* is not represented in either Europe or America, we should dispense with the term *ternatum* and adopt *multifidum*, the one which does apply to the plant of circumboreal regions. This, as found in northeastern America, is identical with the European plant; therefore, it is reasonable to call the variety found in the northeastern states *B. multifidum* var. *intermedium*.

I shall divide the group into two subdivisions, represented by *B. multifidum* and *B. obliquum*, as there are striking characteristics which differentiate them.

One feature which few seem to have noticed—and I consider it an essential point in dividing the group—is the frond coloring during the winter season. *B. obliquum* and its varieties, also *B. dissectum* and *B. alabamense*,

lose the chlorophyll of the frond tissues and usually take on a bronze color as cold weather advances, although if the plant is covered with leaves or grass this does not occur. In the spring, as warm weather approaches, the frond again takes on a green color. I have spent much time in the field and know this to be a fact. With *B. multifidum* var. *intermedium* this is not true, and I take it for granted that all the members of the *multifidum* group show the same tendency. I have grown var. *intermedium* in my garden for five years and find that through the winter season the plant is unchanged in color, remaining green all winter. Mr. F. G. Knowlton of Barksdale, Wisconsin, wrote me that his plants of *intermedium* also retained their green color in winter, whereas those of *B. dissectum* turned a bronze or coppery color. My plants of *intermedium* turn yellow and die down as spring comes on, while the *obliquum* subgroup do not wither until July. It appears that this is because the new frond of *B. multifidum* var. *intermedium* starts through the ground in early spring, while *B. obliquum* and others of its subgroup never appear above ground until July or August. The time that growth starts should help one to distinguish between *B. multifidum* var. *intermedium* and *B. obliquum*. I find many confusing the two, but this should not be if we were acquainted with the plants in the field. I find that herbarium study is one way to determine a plant, and field study quite another way and oftentimes more reliable. Most students rely on the shape of the lobes, and that is quite a satisfactory way of determining their specimens. Often it is the only way we have to know a plant.

Botrychium multifidum (Gmel.) Rupr. is characterized by having pinnae of close-set pinnules, oval in shape, slightly overlapping, or at least appearing to overlap in a pressed specimen. The stalk is usually large and fleshy

and in pressing becomes very wide. The range is northeastern North America and northern Europe. (Fig. 1 was drawn from a Quebec specimen.)

Botrychium multifidum var. *intermedium* (D. C. Eaton) Farwell differs from the former in that the pinnules are not set closely together, but have wide sinuses. The lobes are *oval* in shape and do not overlap. The range is northeastern United States, extending south to northern Iowa, Illinois, Indiana, Ohio, Pennsylvania, and New Jersey. (Fig. 2 represents a Wisconsin specimen.)

Botrychium multifidum var. *oneidense* (Gilbert) Farwell is similar to the former, except that its pinnules are always broadly *oblong* and blunt-pointed. The lobes are usually wide apart, but occasionally a specimen will be found with lobes partially overlapping (as in Fig. 4a). The range is similar to the former, specimens being reported from Minnesota, Wisconsin, Michigan, New York, Pennsylvania, and New Jersey. (Fig. 4a was drawn from a New York specimen.)

Botrychium silaifolium Presl, of the west coast of North America, in some cases quite closely resembles *B. multifidum* var. *intermedium.* Usually it can be distinguished by its triangular or deltiform lobes, but sometimes a specimen is found with lobes that are obovate in form. (Fig. 3 represents a specimen from Bremerton, Washington.)

Botrychium obliquum Muhl. is characterized by having the pinnules narrowly elongate-triangular in general form, tapering to a narrow point. It can always be told from *B. multifidum* var. *intermedium,* with which it is often confused, by its long, narrow, pointed lobes, *intermedium* always having oval lobes. It ranges through the eastern United States as far north as northern Iowa, northern Illinois, southern Michigan, and New York, and

Fig. 1.—Botrychium multifidum. Fig. 2.—B. multifidum var. intermedium. Fig. 3.—B. silaifolium. (All one-half natural size.)

4A

4B

5

6

Fig. 4A.—Botrychium multifidum var. oneidense. Fig. 4B.—B. obliquum var. pennsylvanicum. Fig. 5.—B. obliquum. Fig. 6.—B. obliquum var. tenuifolium. (All three-fifths natural size.)

FIG. 7.—BOTRYCHIUM DISSECTUM. FIG. 8.—B. ALABAMENSE. FIG. 9.—B. BITERNATUM. (All one-half natural size.)

farther east its range extends to Quebec. Why it does not extend farther north in the western part of its range is not fully understood. Herbarium specimens do not show it to be a native of Minnesota or Wisconsin. (Fig. 5 was drawn from a specimen collected at Bentonsport, Iowa.)

Botrychium obliquum var. *tenuifolium* (Underw.) Gilbert differs from the typical form of the species in having pinnae with few divisions only, the lobes being very thin in texture and usually oblong in shape, though sometimes oval or nearly round. It is found in the southeastern United States, where it grows with the typical form except in the southernmost part of its range. I have found the two growing together in northern Georgia and northern Alabama, but I have never found the variety in Tennessee or north of that state, though it has been reported farther north. (Fig. 6 was drawn from a specimen which I collected at Dahlonega, Georgia, where it was growing with the typical form.)

Botrychium dissectum Spreng. can always be distinguished from *B. obliquum* by its lobes being cut into rectangular segments, notched or dissected at the end. This is never true of *obliquum;* its lobes may be evenly notched, but are never deeply cleft into rectangular segments. If one will remember this no trouble need be experienced in telling the two apart. A specimen lying flat on a sheet of paper may look like deeply serrate *obliquum*. Lift it between your eyes and a light, however, and if it is *dissectum* you will at once note the rectangular lobes you did not observe before; if it is *obliquum* it will show no rectangular segments and will appear evenly serrate. *B. dissectum* occupies almost the same range as *B. obliquum,* except that in the west it extends farther north, having been found in southern Minnesota and northern Michigan near the Wisconsin

line, where *B. obliquum* has not yet been reported. (Fig. 7 was drawn from a specimen which grew at Bentonsport, Iowa.)

Botrychium obliquum var. **pennsylvanicum** Graves, var. nov.[1] In several places in Pennsylvania there has been found a variety that somewhat resembles *B. multifidum* var. *oneidense*, but differs in that its pinnules are broadly triangular instead of broadly oblong. It is undoubtedly a variety of *B. obliquum*, because it has always been found in company with that, whereas *B. multifidum* var. *oneidense* is usually found with *B. multifidum* var. *intermedium*. This variety has been found by Prof. W. L. Dix near Morrisville, Pennsylvania, and across the line in New Jersey. It was found also by Mr. Hans Wilkens in Berks County, by Prof. L. S. Hopkins in Alleghany County, and by Mrs. Chas. Y. Tanger, in Lancaster County, all in Pennsylvania. Professor Hopkins has several sheets in his private herbarium, and I have specimens from the other collectors. It has never been found in the west. (Fig. 4b was made from Mrs. Tanger's specimen.)

Botrychium obliquum var. *oblongifolium* Graves was illustrated in Vol. 21, no. 4 of the JOURNAL. It is characterized by having oblong, blunt-pointed pinnules. The first two pairs of pinnae are divided into oblong pinnules; the remaining pinnae above are usually undivided and are oblong in shape. It has been found at two stations in Indiana by Mr. C. C. Deam, and by myself at Bentonsport, Iowa.

In the southeastern United States there is a pair of Botrychiums which differ little in shape of frond, though notably in seasonal development. One starts growth in

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[1] *Botrychium obliquum* Muhl., var. **pennsylvanicum** var. nov., pinnulis late deltoideis. Type in herb. E. W. Graves, collected near Morrisville, Pennsylvania, by W. L. Dix.

July, the other not until December or January. They differ in frond-cutting from both *B. multifidum* and *B. obliquum*, but probably are more closely related to *obliquum*, since one of them, *B. alabamense*, loses the green coloring of the blade during cold weather and takes on a bronze color like *B. obliquum*. The other one, *B. biternatum*, does not do this, as it does not fully develop the blade until about the first of March. It withers and turns yellow before fall. *B. alabamense* probably should be considered the purer type, as it seems to be more plentiful and of wider distribution than *B. biternatum*, although the latter was discovered first.

There is something peculiar about *Botrychium* species growing in pairs. Dr. R. C. Benedict noticed the fact and called attention to it in one of his papers. Thus, in the north we find *B. multifidum* var. *intermedium* and *B. multifidum* var. *oneidense* together, also *B. obliquum* and *B. dissectum*, and in the southeast *B. alabamense* and *B. biternatum* in association.

Botrychium alabamense Maxon has lunulate or fan-shaped pinnules and a long common-stalk. I have seen specimens measuring eighteen inches high. Its range is in the Gulf and South Atlantic states. I found it at three stations near Mobile, Alabama. Mr. F. W. Gray found it near Charlotte, North Carolina, and states that it was common there. It has been reported from southern Georgia, and I believe that if careful exploration were made in northern Florida it could be found there, especially around Tallahassee, where the country seems suitable.

Botrychium biternatum (Lam.) Underw. is very much like *B. alabamense* in cutting, the pinnules being fan-shaped, but the common-stalk is so remarkably short that it barely lifts the blade off the ground. This plant differs from *B. alabamense* in that it begins to show through

the ground in January. By March it is fully mature, and by fall has completely disappeared. *B. alabamense* starts growth in July and is fully mature in September, the fronds persisting until the next spring or early summer. It appears that the separation has not been completely perfected, however, as we find occasional plants that are not mature in late fall. I found one in December with an immature fertile frond, and in Professor Hopkins' herbarium there is a specimen collected by W. C. Dukes of Mobile, Alabama, that had an immature spike in October. It will take more field study with these two Botrychiums before this point can be settled. (Figures 8 and 9 were drawn from specimens that I collected near Mobile, Alabama.)

In conclusion, I wish to express my gratitude to Mrs. Weatherby for making the excellent drawings, and to Mr. Weatherby, Dr. Maxon, and others for help in preparing this paper.

BENTONSPORT, IOWA.

Live Fern Display at the Berkshire Museum, Pittsfield, Mass.

MARY WHARTON MARTIN

Thirty-six ferns and ten fern allies are represented in the Berkshire County Fern Exhibition assembled by Mr. Henry A. Francis, president of the Berkshire Museum's board of trustees. Mr. Francis spent many hours this summer climbing mountains, wading through swamps and marshes, and traversing the most inaccessible parts of Berkshire County to acquire the lovely plants now to be seen in the Botany Room at the Museum.

The ferns are arranged according to the groups given by Mrs. Frances Theodora Parsons (Dana) in her book,

"How to Know the Ferns," and all six groups are well represented. This book is placed on a table near the plants, so that interested visitors may compare live and pictured favorites. More technical works may be consulted by students.

The rarest and most popular fern of the exhibit is Braun's Holly Fern, which was found two years ago in the fastnesses of Mt. Greylock, where it required great patience and perseverance to locate it. Many people, however, prefer the box of tiny dainty spleenworts, backed by the sturdy polypody. Scott's Spleenwort is placed between its parent species, the Walking Fern and the Ebony Spleenwort. Those visitors who enjoy size and magnificence in the fern world can turn to the case where are displayed the Royal, Ostrich, and Interrupted ferns. There are ferns for all tastes, and many viewers, at first casual, linger to admire and study.

The ferns and fern allies exhibited are as follows:

Adiantum pedatum.	**Maidenhair**
Asplenium ebenoides.	Scott's Spleenwort
" *platyneuron.*	Ebony Spleenwort
" ***Ruta-muraria.***	**Rue Spleenwort**
" *Trichomanes.*	Maidenhair Spleenwort
" ***montanum.***	**Mountain Spleenwort**
Athyrium acrostichoides.	Silvery Spleenwort
" *angustum.*	**Lady Fern**
Camptosorus rhizophyllus.	**Walking-fern**
Cystopteris bulbifera.	Bulblet Bladder Fern
" *fragilis.*	**Fragile Bladder Fern**
Onoclea sensibilis.	Sensitive Fern
Pellaea atropurpurea.	Purple Cliff Brake
Polypodium vulgare.	Common Polypody
Polystichum acrostichoides.	Christmas Fern
" ***Braunii.***	**Braun's Holly Fern**
Pteretis nodulosa.	**Ostrich Fern**
Pteridum latiusculum.	Common Brake
Thelypteris Boottii.	Boott's Shield Fern

Thelypteris cristata.	Crested Shield Fern
" " var. *Clintoniana.*	Clinton's Shield Fern
" *Dryopteris.*	Oak Fern
" *Goldiana.*	Goldie's Shield Fern
" *hexagonoptera.*	Broad Beech Fern
" *marginalis.*	Marginal Shield Fern
" *noveboracensis.*	New York Shield Fern
" *palustris.*	Marsh Fern
" *Phegopteris.*	Beech Fern
" *spinulosa.*	Spinulose Shield Fern
Woodsia ilvensis.	Rusty Woodsia
" *obtusa.*	Blunt-lobed Woodsia
Osmunda cinnamomea.	Cinnamon Fern
" *Claytoniana.*	Interrupted Fern
" *regalis* var. *spectabilis.*	Royal Fern
Botrychium angustisegmentum.	Lance-leaved Grape Fern
" *ternatum* var. *intermedium.*	Ternate Grape Fern
Equisetum hyemale var. *affine.*	Scouring Rush
" *arvense.*	Common Horsetail
" *sylvaticum* var. *pauciramosum*, forma *multiramosum.*	Wood Horsetail
Lycopodium annotinum.	Stiff Club-moss
" *clavatum.*	Running-pine
" *complanatum* var. *flabelliforme.*	Ground Pine
" *lucidulum.*	Shining Club-moss
" *obscurum.*	Tree Club-moss
Selaginella rupestris.	
" *apus.*	

Fern Field Notes, 1935

EDGAR T. WHERRY[1]

A KENTUCKY STATION FOR ADIANTUM CAPILLUS-VENERIS.—Learning that the Southern Maidenhair had been reported from the vicinity of Burnside, Pulaski County, Kentucky, a visit was made to that town in July, in company with Professors S. C. Palmer of Swarthmore College and Thomas N. McCoy of Catlettsburg, who is writing up the ferns of the state. On inquiring as to the possible presence of any cataracts in that vicinity, we were directed to one about one and one-half miles to the west, along State Highway No. 90, on the south bank of Cumberland River below Bronston P. O. On going there we found a large spring emerging from a limestone cavern, but thorough search of the cliffs and talus failed to yield this or any other noteworthy fern. Just as we were leaving, I noticed that although a current of very cold air accompanied the outflowing water, a counter-current of decidedly warm air could be felt. Realizing that the place to look for a subtropical plant in this northern latitude would be in the warmest situation, the stream was followed to the point where it descended over a series of limestone ledges into the river and no influence of the cold cavern air remained. Here the fern sought proved to be growing in the greatest luxuriance. On previous occasions I have found rare plants by flashlight, and once detected an as yet undescribed *Dryopteris* in Alabama by seeing its reflection in a mirror while shaving beside a purling brook, but this was the first time I had ever located anything by the aid of hot air!

ASPLENIUM BRADLEYI IN NEW JERSEY.—On April 7, 1935, a group of six members of the American Fern Society visited the cliffs of a spur of Kittatinny Moun-

[1] Contribution from the Botanical Laboratory and Morris Arboretum of the University of Pennsylvania.

Fig. 1.—Pellaea densa at its southeastern limit, Black Lake, Quebec.

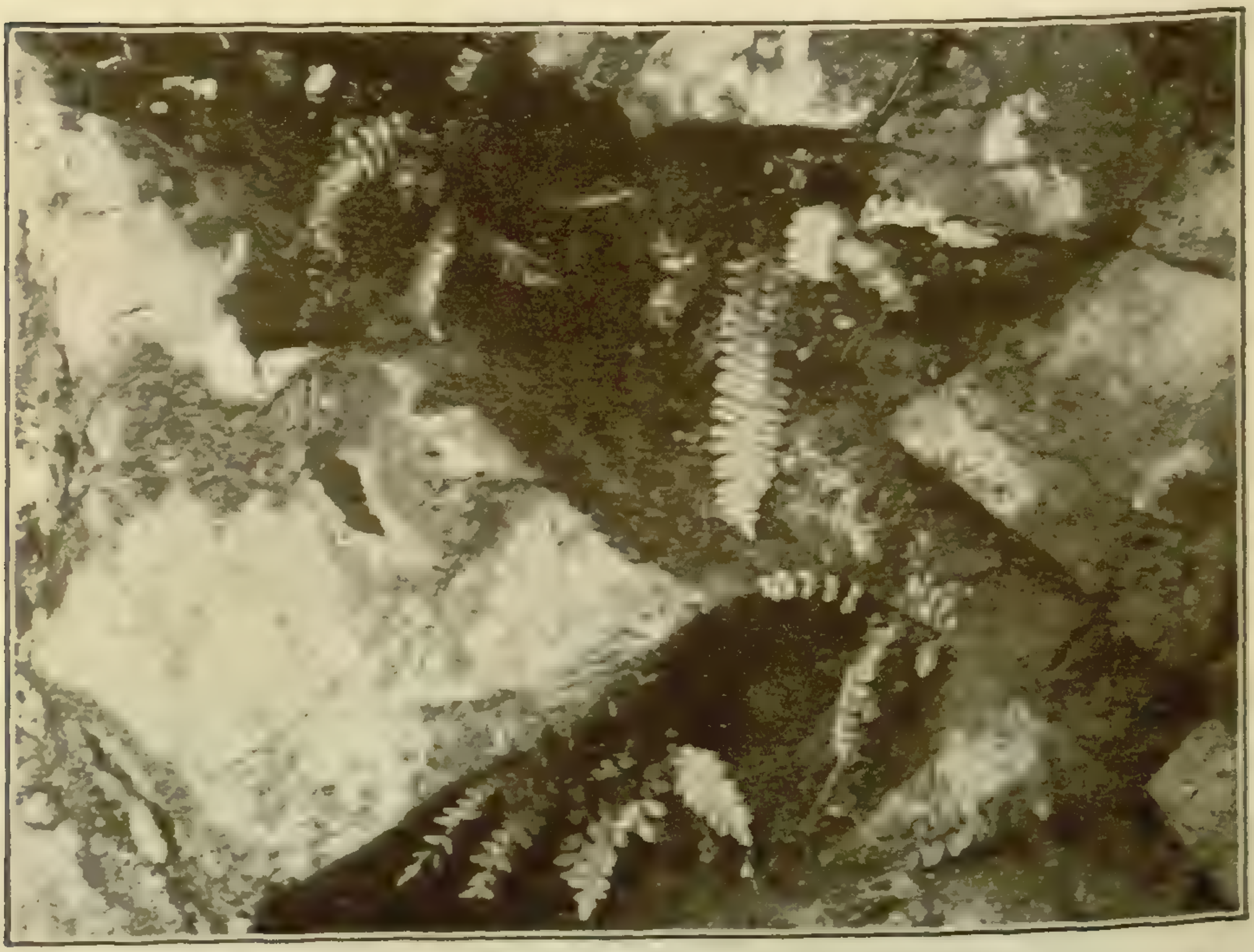

Fig. 2.—Asplenium resiliens at its northeastern limit, Franklin Co., Pennsylvania.

tain, about 5 miles northwest of Blairstown, Warren County, New Jersey, in the hope of rediscovering *Asplenium Trudelli,* collected there by Carhart many years ago. *Asplenium montanum* was found in abundance, several miles east of its previously known colonies near Delaware Water Gap, but *A. Trudelli* eluded us. Then just as we were about to leave, a single plant of *A. Bradleyi,* not previously reported from the state, was noticed in a vertical joint-crevice in the quartzite cliff. Five months later the place was revisited, in company with Mr. Harry W. Trudell, and the cliff was more fully explored. Not only were six additional plants of this species found, in other joint-crevices, but also a colony of the hybrid *A. Bradleyi* × *montanum.* The station is 40 miles, as the spore blows, east of the nearest known Pennsylvania occurrence of *A. Bradleyi* at Glen Onoko, Carbon County, and about 75 miles southwest of the long-lost colony in the Shawangunk Mountains in Ulster County, New York.

ASPLENIUM RESILIENS IN PENNSYLVANIA.—Ever since the finding of the black-stem spleenwort in Maryland last year I have cherished the hope of extending its range still farther north, and on September 12 made a systematic search for it. In the main limestone valley around Greencastle there seemed to be no cliffs of sufficient size to furnish a favorable habitat for it, but in a narrower strip of limestone east of Mercersburg several promising cliffs were located and searched, one after another. Although the only abundant fern of this group was *A. trichomanes,* a small colony of the species sought was finally found on one sheltered cliff. (See Plate 12, fig. 2.) To avoid possible destruction by over-enthusiastic collectors its exact location will not be divulged, but it lies in Franklin County, well north of the Mason and Dixon line.

PELLAEA DENSA AND SOME OTHER FERNS IN SOUTHERN QUEBEC.—On August 25 a visit was paid to Black Lake, Megantic County, Quebec, to search for the southeastern-

most recorded station for the fern best known as *Pellaea densa* (Brack.) Hook., also bearing the name *Cheilanthes siliquosa* Maxon, although it perhaps does not belong to either of these genera. A large colony of it (see Plate 12, fig. 1) was finally located after a long and strenuous trip through the woods and swamps, and in order to save others unnecessary effort the following directions may be given. From Black Lake village drive south along highway No. 1 for two miles, when an electric power line will be seen crossing the lake and extending westward into the hills. Follow this for a mile, and a prominent cliff of serpentine will come into view to the north. Cross the intervening swamp and climb to the top of the talus slope.

The following also seem worth recording: *Cryptogramma Stelleri* and *Woodsia glabella*, three miles north of Leeds Station, Beauce County, on a phyllitic mica schist which looks non-calcareous, but contains enough lime to neutralize the crevice-soil; *Dryopteris fragrans* and *Woodsia glabella* on a serpentine cliff four miles southwest of the same Station; and *Dryopteris Boottii* in a dense alder thicket at the south end of Black Lake.

LYCOPODIUM POROPHILUM.—The Cliff Staghornmoss has been variously interpreted as a distinct species, a variety of *L. lucidulum*, and a variety of *L. Selago*. In the hope that field study might aid in deciding which view to accept, visits were made to several stations for it in Kentucky, Ohio, Pennsylvania, Virginia, and Wisconsin. Although it is sometimes alleged to grow on calcareous substrata, in every colony seen the rock was siliceous and the soil reaction mediacid. Everything about its habitat and aspect indicated it to represent an ecological derivative of the dwarfer and more appressed-leaved *L. Selago* (*typicum*), resulting from the falling of spores of this occupant of bleak situations into more sheltered crevices at lower altitudes or latitudes.

PHILADELPHIA, PA.

Cystopteris fragilis or C. Filix-fragilis?

E. D. MERRILL

In the original edition of Linnaeus' "Species Plantarum" (1753) two binomials appear on page 1090, *Polypodium F[ilix] mas* and *P. F[ilix] femina.* The first is the basis of *Dryopteris Filix mas* Schott, with the following synonyms: *Polystichum Filix mas* Roth, *Aspidium Filix mas* Sw., *Nephrodium Filix mas* Rich., *Tectaria Filix mas* Cav., *Lastrea Filix mas* Presl, and *Lophodium Filix mas* Newm. The second is the basis of *Athyrium Filix femina* Roth, with the following synonyms: *Aspidium Filix femina* Sw., *Tectaria Filix femina* Cav., *Nephrodium Filix femina* Michx., *Asplenium Filix femina* Bernh., *Cyathea Filix femina* Bertol., *Cystopteris Filix femina* Coss. & Germ., and *Lastrea Filix femina* Colomb.

On page 1091 the binomial *Polypodium F[ilix] fragile* occurs, the specific name apparently being taken from the pre-Linnaean reference to Plukenet, *Filix saxatilis, cauliculo tenui fragili.* While the specific names *Filix mas* and *Filix femina* have consistently been accepted by all post-Linnaean botanists, *Filix fragile* has with almost equal consistency been ignored. This is probably because in his "Flora Svecica" ed. 2 (1755), and the second edition of the "Species Plantarum" (1763), Linnaeus used the binomial *Polypodium fragile* instead of *P. F.[ilix] fragile.* In all his works he consistently used *P. Filix mas* and *P. Filix femina;* but these were widely used pre-Linnaean phrase names and *Filix fragile* was not a .name so used. It seems highly probable that *P. F[ilix] fragile* was printed by oversight in 1753, *P. fragile* being intended; it is, however, actually published and perhaps should be accepted. Summarizing Linnean usage it is to be noted that in 1753, in his

"Systema Naturae" ed. 10, 1759, ed. 11, 1760, ed. 12, 1767, ed. 13, 1779, he used the binomial *Polypodium F. fragile*, while in 1755 and 1763 the shorter *P. fragile*.

Chiovenda, in 1903, transferred *Polypodium Filix fragile* to *Cystopteris*, Farwell making the same transfer a few months later in the early part of 1904. I quote below Chiovenda's[1] statement:

> "Il nome della *Cystopteris fragilis* Bernhardi devesi correggere in *Cystopteris Filix fragilis* poichè Linneo (1) la chiamò così, scrivendo *Polypodium F. fragile* a quella guisa che per il *Polystichum Filix mas* Roth (2) scrive *Polypodium F. mas*. Non è certo per errore di stampa che si trova scritto *fragile* poichè Linneo ha usato il *Filix-fragile* come un solo aggettivo che necessariamente deve concordare con *Polypodium* (3).
>
> "(1) Linn.—*Species Plantarum* ed I (1753), p. 1090.
>
> "(2) Linn.—*Ibidem.*
>
> "(3) Ascherson.—*Synopsis der Mitteleuropäischen Flora* I. (1896), p. 16, dopo riportata la citazione esatta della prima edizione aggiunge semplicemente: [sic, wohl Schreib- oder Druckfehler]."

The evidence seems to favor the idea that the original use of the specific name *F. fragile* was an error that Linnaeus himself corrected three and ten years later, although he failed to make the correction in the tenth edition of his "Systema Naturae" in 1759, and in succeeding editions of that work. This has been discussed by Weatherby[2] who calls attention to the fact that in all other cases where Linnaeus used double specific names

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[1] Chiovenda, E. Sul nome di alcune Felci nostrali. Ann. Bot. Pirotta 1: 208–210. 1903.

[2] Rhodora 28: 130–131. 1926.

composed of a substantive and an adjectival element, the latter agrees in gender with its own noun, not with the name of the genus if the two differ. He claims that if Linnaeus had intended a double trivial name in this case he would presumably have followed his otherwise invariable custom and written "*F. fragilis,*" but he actually wrote "*F. fragile,*" the *fragile* agreeing not with *Filix* but with *Polypodium.* He also notes that the other two trivial names *Filix mas* and *Filix femina* were phrase-names universally used in Linnaeus' time, but there is nothing to indicate that "*Filix fragile*" was anything of the kind. He concludes that the "*F.*" in the *Polypodium F*[*ilix*] *fragile* in the first edition of the "Species Plantarum" was, at least by inference, an error that Linnaeus himself corrected at the first opportunity, and that although it persisted through several editions of the "Systema" this was probably due to oversight on his part. He gives *Cystopteris fragilis* the benefit of the doubt, and retains this binomial rather than replace it by *C. Filix fragilis* on doubtful evidence.

As further evidence that the use of *F.* in the binomial *Polypodium F. fragile* in the first edition was probably a misprint, all of the compound specific names in the first edition, as listed by Hiern,[3] were checked against those in the second edition, this being the only case noted where any essential change was made. *Hypnum crista castrens* was changed to *H. crista castrensis, Robinia Pseudo Acacia* to *R. Pseudo-Acacia, Scilla Lilia Hyacinthus* to *S. Lilio Hyacinthus,* and *Solanum Pseudo Capsicum* to *S. Pseudocapsicum.* Of course most of these names were merely pre-Linnean ones taken over bodily.

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[3] Hiern, W. P. Index Abecedarius: An alphabetical index to the first edition of the Species Plantarum of Linnaeus. Jour. Bot. 44: Suppl. 1–44. 1906. Reprinted in Junk, W., Indices nominum trivialium ad Linnaei Species Plantarum, ed 1. 51–92. 1907.

Although I was first inclined to accept Chiovenda's binomial for this widely distributed fern my present inclination is to retain the binomial *Cystopteris fragilis* on the basis that the original *Polypodium F*[*ilix*] *fragile* was probably an error. Presumably an author in the middle of the eighteenth century could correct his own errors, even as we correct some of our own today. If we had a conserved list of specific names, undoubtedly *Cystopteris fragilis* would be included therein.

The synonymy of this fern in so far as the specific names *fragilis* and *Filix fragilis* are concerned is as follows:

CYSTOPTERIS FRAGILIS (Linn.) Bernh. Neues Journ. Bot. Schrad. **1** (2) : 27. *t. 2. f. 9.* 1806.

Polypodium fragile Linn. Fl. Svecica, ed. 2, 374. 1755; Sp. Pl. ed. 2, 1553. 1763.

Polypodium Filix fragile Linn. Sp. Pl. 1091. 1753; Syst. Nat. ed. 10, 1327. 1759; ed. 11, 1327. 1760; ed. 12, **2**: 693. 1767; ed. 13, **2**: 693. 1770.

Cyathea fragilis Sm. Mem. Accad. Turin **5**: 417. 1793.

Aspidium fragile Sw. in Journ. Bot. Schrad. **1800** (2) : 40. 1801.

Athyrium fragile Spreng. Anleit. **3**: 136. 1804.

Cyclopteris fragilis Gray, Nat. Arr. Brit. Pl. **2**: 9. 1821.

Cystea fragilis Sm. Engl. Fl. **4**: 298. 1828.

Filix fragilis Underw. Our Nat. Ferns, ed. 6, 119. 1900.

Cystopteris Filix fragilis Chiov. Ann. Bot. Pirotta **1**: 210. 1903; Farwell, Ann. Rep. Michigan Acad. Sci. **6**: 200. 1904; Schinz & Thellung, Vierteljahrs. Naturf. Gesellsch. Zürich **61**: 414. 1916; Pampanini, Fl. Caracorum 66. 1930.

Filicula Filix fragilis Farwell. Am. Midl. Nat. **12**: 251. 1931.

Those botanists who follow the International Code will continue to use the generic name *Cystopteris* Bernhardi

(1806), typified by this species, instead of *Filix* Adanson (1763), as the former was placed in the list of conserved generic names by the Cambridge Botanical Congress in 1930, and this retention of *Cystopteris* automatically eliminates *Filicula* Seguier (1754). For a discussion of the generic name *Filix* see Woynar, H. "Zur Nomenklatur einiger Farngattungen II. Filix," Hedwigia **56**: 381–387. 1915. As to *Filicula*, Farwell, in accepting Seguier's name in place of *Cystopteris* Bernhardi, apparently did not examine Seguier's work (Pl. Veron. Suppl. 1754). The name *Filicula* appears on page 54 without a generic description, with two species "Filicula alpina, foliolis rotundioribus & crenatis *Ponted. Comp. Tab. Bot. 19. n. 1.*" page 54, and "Filicula alpina crispa *C. B. Pin. 354. Moris. Hist. 3. 581. Tab. 4. fig. 27*" with the synonym "*Felce crespo sassatile* Pon. Viag. di Mont. Bald. 224" page 55. There are no binomials. There is thus no reason for accepting *Filicula* Seguier as a properly published generic name. The still earlier *Filicula* Tournefort (1700) is the same as *Cystopteris*, but is pre-Linnaean and hence not available to replace *Cystopteris* Bernh. Seguier certainly does not validate Tournefort's generic name.

THE NEW YORK BOTANICAL GARDEN.

Recent Fern Literature

Roberts, Edith A., and Lawrence, Julia R. American Ferns: How to Know, Grow, and Use Them. 87 pages. Macmillan, 1935. $2.50.

There has just been issued this new book on "American" ferns, which examination shows to be pitifully inadequate, being compiled from obsolete and untrustworthy sources. It does not deserve a real review in THIS JOURNAL, but as it is being given publicity in various magazines—most of whose editors merely copy extracts

from the overdrawn publisher's announcement, rather than read it—our members should be informed as to its character.

It includes a description of a method of growing spores in culture solutions, impractical suggestions as to cultivating ferns in formal gardens, an attempt to classify species into imaginary "associations," and a key so artificial and inaccurate as to be practically useless. To illustrate the authors' utter unfamiliarity with the subject, it may be noted that they group *Scolopendrium* and *Aspidium cristatum* in an "oak association," *Dicksonia* and *Lygodium* in a "shrub association"; key out *Osmunda regalis* in contrast to *Woodsia alpina;* and recommend *Woodsia ilvensis* to furnish "a pleasing view to the hurrying motorist!"

Alston, A. H. G. Pteridophyta of Antigua. Journ. Bot. Brit. & For. **73**: 33–40. Feb. 1935.

Mr. Alston in this article on "Pteridophyta of Antigua" summarizes the records known to him relating to the fern flora of this West Indian island. He notes that "The British Museum has recently received a collection of thirty-five species of Pteridophytes made by Mr. Harold E. Box." The latter believes this collection represents all those growing wild in the island.

It is a matter of interest that with the title of "Pteridophyta of Antigua" all but one of the species reported are true ferns; there are no Lycopods or Equisetums, only Psilotum. With its rather low altitude and with almost complete denudation of original vegetation, the number of fern species is limited, compared to that of West Indian islands with high mountains. No new species are described.

Alston, A. H. G. Mr. John Gossweiler's Plants from Angola and Portuguese Congo. Journ. Bot. Brit. & For. **72**: 1–8. Supplement. Sept. 1934.

The present article deals with the ferns and pteridophytes from a very far-off region. Amid these strange surroundings, one meets, with some surprise, such a familiar friend as *Pteridium aquilinum* in "shrub-grown gravelly grounds," although the habitat sounds familiar enough. Also "in clumps skirting the rocky portion of the banks of the rivulets" *Osmunda regalis* might be found. The Florida fern student would find *Dryopteris dentata* and *D. patens.* Altogether the report lists ferns and other pteridophytes representative of thirteen families and includes one new species, *Lomariopsis hederacea.*

With the exception of these species, the fern student in the Congo region would apparently find nothing familiar. To the reviewer, such a report as this is always a stimulus to travel—taken in the easiest way, that is, sitting in an easy chair and with attention completely detached from immediate surroundings.

The tree fern *Cyathea Manniana,* "with spiny trunk, height 6 m.," grows "gregarious in wet humid ravines."

Dryopteris athamantica (Kze.) O. Ktze. grows "in meadows" and "in the shade of Andropogon and tree-ferns near Forte Uije." It is also noted as "used in South Africa as a vermifuge for the cure of tapeworm."

So, in the pages of this matter-of-fact summary, made doubtless from dried specimens and collectors' notes, there is a possibility of faring far afield and of making the acquaintance of ferns much unlike those of our native region.

Raunkiaer, C. "On the Significance of Cryptogams for Characterizing Plant Climates" in *The Life Forms of Plants* (The Clarendon Press, Oxford, 1934).

The article here reviewed occurs as one chapter (pp. 435–442) in a series of translated articles which have been assembled to present Prof. Raunkiaer's contributions to plant ecology. In general, the large volume is

devoted chiefly to seed-plants. In this particular chapter the significance of various types of pteridophytes for general ecological survey is discussed. For this purpose only the pteridophyte phylum is considered to have general comparative significance.

On the basis of a study and analysis of 100 local floras, and taking 1900 as a base for relative species numbers, the writer finds that pteridophyte species number some 5600, as compared to a total of 140,000 seed plants. This, he points out, represents a ratio of 1:25. With this as a starting point, he has analyzed the relative abundance of pteridophytes in numerous local floras. In general, taking the world ratio as a standard of comparison, he finds considerable variation in different regions. Thus, the Island of Tahiti has over twelve times as many pteridophytes in proportion to seed-plants as the world at large. In general, north temperate regions follow approximately the 1:25 ratio with slight variations. Further, as is well known, tropical regions with abundant rainfall, show higher proportions. Oceanic islands with favorable environment show generally the highest ratios.

One other general finding emerges from the study, namely, that pteridophyte species usually have wider distribution than seed-plant species. The paper continues with a discussion of possible reasons for variations in ratios, and for the wider distribution of pteridophyte species. That pteridophytes prefer moisture and warmth is familiar, and understandable on the basis of their reproductive methods. The seed habit possesses many advantages, tiding plants over periods of untoward environmental conditions.

Why are pteridophyte species wider in their distribution? Dr. Raunkiaer ascribes this to the fact that their unicellular spores are much more favorable for wide dis-

tribution than the heavier seeds. Thus, in tropical islands, where favorable environment may be widely present, it might be expected that the spores of many types of pteridophytes would be deposited by wide-ranging winds.

The study suggests interesting questions with respect to the relation of our own pteridophyte flora as compared with that of Europe and Asia. Is it a fact that relatively more of our pteridophyte species are common to both regions than the seed-plant types?

In an account of the plants used by the Indians of the west side of the Olympic Peninsula, Washington, Mr. Reagan includes four fernworts. *Athyrium alpestre* var. *americanum* was employed medicinally—Mr. Reagan does not say for what disease. The roots of the western polypody and of *Equisetum variegatum* and *E. hyemale* were dug and eaten, or at least chewed, for their sweetish taste. From the pounded and dried roots of the western bracken bread was made. Mr. Reagan states that the Indians have many myths about this fern.[1]

Drs. Christensen and Ching have published a detailed and well illustrated account of their new genus *Pteridrys*, already briefly published in Christensen and Holttum's article on the ferns of Mt. Kinabalu. The genus is a segregate from *Dryopteris*, typified by *D. syrmatica* and containing seven species of the Asiatic tropics.[2]

Concerning the records of bracken on calcareous soil reviewed in this JOURNAL, M. Gardet issues a word of

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[1] Reagan, A. R. Plants used by the Hoh and Quilante Indians. Trans. Kansas Acad. Sci. **37**: 55–70. 1934.

[2] Christensen, C., and Ching, R. C. Pteridrys, a new Fern Genus from Tropical Asia. Bull. Fan Mem. Inst. **5**: 125–148, pls. 2–20. 1934.

warning. It is not enough, he says, merely to note the presence of bracken on apparently calcareous soil. Chemical analysis and study of the physical character of the soil and subsoil and of the immediate environment generally would, he believes, explain most of the seemingly exceptional cases and would show that bracken is in reality and almost without exception a plant of acid soils of a certain physical character.[1]

Shorter Notes

A NEW LOCALITY FOR BRAUN'S HOLLY FERN.—During the past season a single frond of *Polystichum Braunii* was received from Mrs. Breck Aspinwall, of Rome, N. Y., who stated that it was collected by her in a ravine on Quaker Hill, about ten miles north of Rome. I visited the locality in August, and found a fair sized colony of at least 50 plants of various sizes scattered along the base of a crumbling shaly ravine (Lorraine shale) descending to the north branch of the Mohawk River near the "Bear-town" school on Quaker Hill, north of Rome. There are several similar ravines in this section and the fern may be looked for also in them.—H. D. HOUSE, N. Y. State Museum.

CERATOPTERIS THALICTROIDES IN JAMAICA.—This species, which is widely dispersed in the Old World tropics, was attributed to America by Benedict, in his revision of the genus,[2] on the supposedly doubtful basis of a single specimen (*Hart* 124) in the National Herbarium, said to have come from Jamaica but for which more definite data are wanting. Recently, however, I

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[1] Gardet, G. A propos d'Eupteris aquilina (L.) Newman. Bull. Soc. Bot. France **81**: 255–261. 1934.

[2] Bull. Torr. Bot. Club **36**: 463–476. 1909.

have examined two additional Jamaica specimens, old but remarkably well preserved, which prove to be of this species. They belong to the so-called Jamaica Herbarium, at Hope Gardens, near Kingston, and were collected long ago by G. Ewing, the data being "J. P. 507; lagoon; Ewing's Caymanas." The Hart record is thus substantiated, and *C. thalictroides*, whether native or (as seems more probable) adventive, may be safely reckoned a member of the Jamaican fern flora. Ewing's Caymanas, an unusual name, does not appear on maps of Jamaica. It was one of a group of "Caymanas" sugar estates in the parish of St. Catherine, and has been merged with Ellis Caymanas and Taylor Caymanas in a single estate. The lagoon mentioned—from which an effort is being made to obtain new specimens—lies at the western edge of an extensive morass near the source of Fresh River, just above sea-level, about five miles inland from the coast and some three or four miles northeast of Spanish Town. For information regarding this interesting locality I am indebted to Mr. Frank Cundall, Secretary of the Institute of Jamaica, Kingston.—WILLIAM R. MAXON, U. S. National Museum.

HART'S TONGUE FERN RECORDS.—The note by Dr. G. Ledyard Stebbins, Jr., in the last number of this JOURNAL, p. 106, concerning the colony of Hart's Tongue found by him near Stockbridge Falls, Madison County, N. Y., prompts me to suggest the need for a complete published record of where, when, and by whom, plantings of this fern have been made. The present records all relate to New York State.

A few years ago Mr. Leland S. Stater found a few healthy plants in a limestone ravine a few miles west of Coxsackie, Greene county. Investigation revealed that

they had been placed there by Miss Charlotte Bogardus, of Coxsackie.

About ten years ago I obtained from Mr. Ransier several plants which I placed on the shaded, north-facing limestone talus of the cliffs about three miles east of South Bethlehem, Albany County, where they seem to be well at home.

At some time about 1900 I transplanted several plants from Jamesville to a location above the railway station at Munnsville, Madison County, where they seemed to thrive for a few seasons. I have not found it convenient to revisit the place recently and do not know their fate, but the place is 2½ miles in a direct line from the Stockbridge Falls locality mentioned by Dr. Stebbins. The locality reported by Dr. Stebbins is 12 miles almost due east from Chittenango Falls and 11 miles a little southeast of the Perryville station. Unless it develops that some one else has placed the fern there, it constitutes a new native colony of the fern in a region where Dr. Maxon and myself have always expected or hoped it might be found, because of the favorable habitat.

These observations accentuate the need for planting records of the Hart's Tongue fern, and the request is made that readers having such information send it to Mrs. Elsie G. Whitney, New York State Museum, Albany, N. Y. The data should include: (1) Place and date of planting; (2) source of plants used; (3) name of person making the planting; and (4) length of time the transplanted ferns survived, date when last seen, increase (if any), and present condition.—H. D. HOUSE, New York State Museum.

American Fern Society

The preliminary report of the special committee to investigate the affairs of the Society was published in this JOURNAL, **24**: 60, 1934. Their final report, dated November 10, 1934, contains a detailed statement of the situation with reference to the accounts of the former Treasurer. Three paragraphs from the report may be reproduced here:

"In the earlier years of his occupancy of the office he did good work and probably served the Society honestly. It seems reasonable to believe that the time came when, finding himself in need of money, he yielded to the temptation to use some of the Society's funds, counting upon his ability to replace what he had taken. Such a course would easily lead to further misappropriations.

"It would be less difficult to feel kindly toward the ex-treasurer if he had faced the situation with some show of manliness, had acknowledged his misdoings, and done what he could to make amends. Instead of that, he has done his best to cover up, has refused to cooperate with the committee, even to the extent of giving the information which he could give. Furthermore he has shown no shadow of regret for the injury he has done the Society, or for the trouble and anxiety he has caused its officers.

"While the committee sees no grounds for expecting that the Society will ever recover from the ex-treasurer any part of its claim, we have asked our attorneys to keep the case open in their office and on their minds, and to take advantage of any development that may be favorable to the Society's interests."

The committee also gave attention to the Constitution, and while recognizing no need for radical changes has recommended certain amendments. One concerns arrangements for annual auditing of the Treasurer's accounts, as well as requiring the Treasurer to submit to the Council *interim* reports of the Society's financial status. Another concerns plans for the permanent fund, both as to safeguarding and at the same time making emergency

use of the principal possible. Changes in the wording of the sections concerning elections are urged, in order that independent nominations for the several offices may be more readily made by members.

The committee were so good as to consider also several additional matters, notably the bonding of the Treasurer, the Incorporation of the Society, and the desirability of having the Society's herbarium transferred to some eastern institution. Steps are being taken to act upon their suggestions as soon as practicable.

EDGAR T. WHERRY, *President.*

CONVOCATION WEEK MEETING, DECEMBER 31, 1935

A joint meeting of the American Fern Society and Section G of the American Association for Advancement of Science will be held in St. Louis, Missouri, on Wednesday afternoon Jan. 1, 1936. Dean Lewis S. Hopkins, of Culver-Stockton College, Canton, Missouri, will take charge of this meeting for the Society, in the absence of the President and Vice-President. The list of papers to be presented will be found in the general program of the Convocation Week meetings, obtainable at time of registration. Dr. George T. Moore, Director of the Missouri Botanical Garden, is the local representative of the Society in connection with these meetings, and inquiries as to arrangements may be addressed to him.

TWENTY-FIVE YEAR INDEX TO THE JOURNAL

With this issue the AMERICAN FERN JOURNAL completes it 25th volume, its first number having appeared on August 16, 1910. Indexes have been published in the final number of each volume, but the desirability of a cumulative index is so obvious that the preparation of one is being undertaken. This, it is hoped, will be ready about the middle of 1936 and will be sold at cost of printing.

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ERRATA

Page 44, line 21, for D., read DRYOPTERIS
Page 75, line 12, for wtih, read with
Page 77, line 13, for Lastrea, read *Lastrea*
Page 95, after line 17, insert, as line 18, C. A. WEATHERBY

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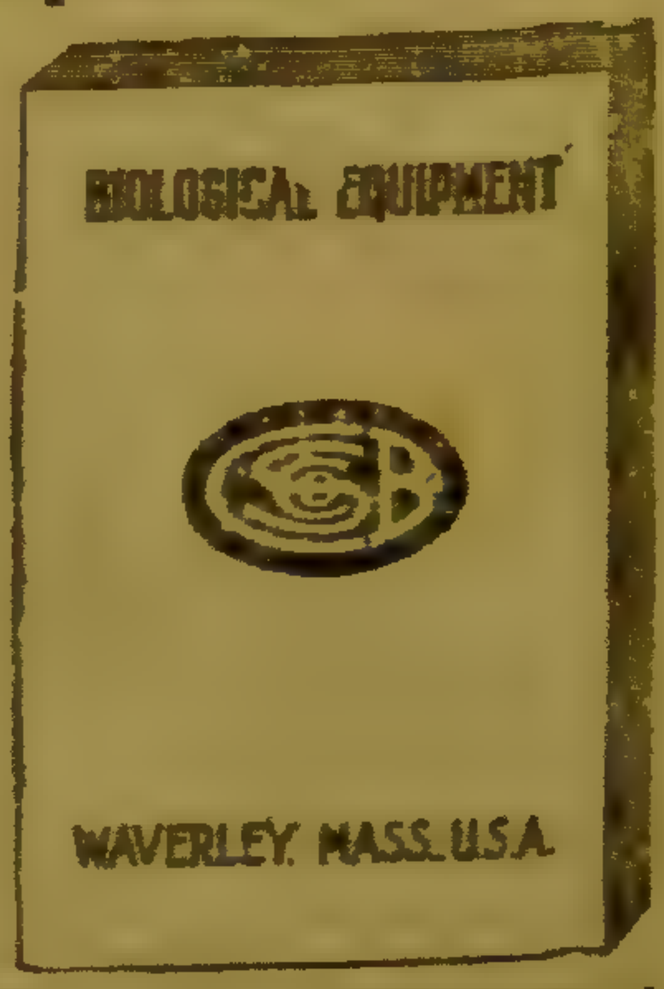

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American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

R. C. BENEDICT
W. R. MAXON
E. J. WINSLOW
C. A. WEATHERBY

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LANCASTER, PENNSYLVANIA

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Published by the

AMERICAN FERN SOCIETY

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R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

VOL. 26 JANUARY–MARCH, 1936 No. 1

Growing Florida Ferns

MARY W. DIDDELL

Several years ago I had a small fishpool made on my place, and started bringing home ferns from the woods to grow around it. That was the beginning of my fern collecting and study, and since that time my collection has included all the ferns found in this section of the state and many of the more definitely tropical species. I hope eventually to have a complete collection of every fern native to Florida. About two years ago I built a fernhouse, with glass roof and the floor three feet below the ground level, thus insuring an even temperature and moist atmosphere; and in this house I keep the small and more tender species.

My collection started with the two Osmundas, both of which attain a large size with us; I once found *O. regalis* with fronds eight feet long. Here the Osmundas produce a fall crop of sporophylls, usually in November, and I recently found *O. cinnamomea* with sporophylls nearly six feet high. After the Osmundas, I brought in *Pteris latiuscula, Lorinseria areolata, Anchistea virginica, Asplenium platyneuron, Athyrium asplenioides, Dryopteris normalis, D. floridana* and *D. thelypteris*, all common ferns in this section. These are all perfectly at home under the shade of a Live Oak tree, in the leaf mould which they naturally find there. *Salvinia* multi-

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plies rapidly in the pool, but *Azolla* has to be replaced occasionally, as it washes out easily. *Botrychium obliquum* flourishes in the fall and produces its sporophylls, then dies back completely through the summer.

In a jungle close to the ocean I found magnificent plants of the Golden Polypody, *Phlebodium aureum*, and in the same place, frequently on the same Palmetto stems, are great masses of the Shoestring Fern, *Vittaria lineata*, with fronds an eighth of an inch wide and several feet long, the sporangia borne in two long grooves down the back. The *Phlebodium* grows always high up on the Palmetto, in the leaf bases, just below the crown of leaves, but the *Vittaria* is not particular about height and I have seen trees liberally covered with it in cascading masses from crown to base. In this same jungle is a Live Oak tree worth going miles to see, its immense wide-spreading limbs covered with the Resurrection Fern, *Polypodium polypodioides*, intergrowing with *Epidendrum conopseum*, the only epiphytic Orchid growing this far north. This Resurrection Fern is the finest I have ever seen outside the tropical portion of the state. I peeled off large mats of the *Polypodium-Epidendrum*, and tacked them (with carefully bent wires) on the bark of two of my own Live Oak trees, where the plants seem perfectly at home. The fern stays green and fresh, by being watered in dry weather. The Orchids began to bloom in August and have only finished within the last few weeks (February). I have found the *Vittaria* only in this one jungle, in this county, but have found the Golden Polypody on one of the islands at the mouth of the St. John's River also.

On another of these coastal islands at the river's mouth, Fort George Island, is a shell mound of considerable extent. Scattered over it are fallen trees, uprooted by hurricanes, their up-ended roots high in the air with

masses of shell-filled soil clinging to them, and it is in the calcareous soil on the almost perpendicular sides of these roots that one finds the rare *Cheilanthes microphylla*. It occurs also on a similar shell-mound on Caxambas Island, south of Fort Myers. I have searched the shell mound over on several occasions, but have never found more than three colonies at one time, these always growing in association with *Asplenium platyneuron*. This island is privately owned, for the most part by progressive individuals, who are true conservationists and carefully guard its real botanical treasures. It contains an ancient blockhouse, numerous slave-houses, and some other century-old buildings of tabby-stone, and in the cracks and crevices of these ancient buildings *Asplenium platyneuron* finds a foothold, though here it is very small, never more than a few inches high. This *Asplenium* is not common in our county. I have found it elsewhere only on the steep slopes of the bluffs on the south side of the St. John's River, where, in the rich loamy soil, it grows much larger. At the foot of the same bluff there is a very fine stand of *Athyrium asplenioides*, the fronds growing to a height of three feet, with pale, pink-purple rachises.

I have never found any *Adiantum* here, for it is a lime-rock fern and we have practically no rocks. *Adiantum Capillus-Veneris* was, until a few years ago, a beautiful sight in the fern-room of the old fort at St. Augustine, but repairs to the roof cut off the water seepage and it almost entirely died out. However, provision has now been made to admit water, and the ferns were coming back the last time I was there. On the outside walls of the fort and particularly on the north wall of the portcullis are numerous patches of *Adiantum*, dwarfed by wind and sunshine. *Cyrtomium falcatum* also grows plentifully on the outside walls of the fort and portcullis. I brought home a plant of each from the portcullis wall

and later found another plant of *Cyrtomium* growing on a brick wall close to the water on a river-front estate at the south side. Dr. Benedict assures me that they were sporeling escapes from cultivated plants. The one from the portcullis wall is a fine healthy plant, but the edges of the fronds are almost perfectly entire, whereas the florists' plants are deeply toothed.

Since building the fernhouse I have made numerous trips into the lime-sink region of Alachua County, which is truly a paradise for the fern student. These sinks are perfect natural ferneries and deserve a few words of description. The Devil's Mill Hopper, about six miles from Gainesville, is a circular hole in the ground, about 125 feet deep and 250 feet across, or more. The sides are either perpendicular or else the lower half shelves over. There is only one path to the bottom, but one can work one's way almost entirely around the upper half of the wall.

Numerous springs flow out of the sides; and in spite of the fact that Ripley states that there is only one waterfall in Florida, there are 21 genuine, honest-to-goodness waterfalls in this sink! The floor is raised in the middle and in wet weather is covered with high grass. Most of the waterfalls (and springs) are grouped in less than half of the sink wall. Their water runs together into one stream, which circles a part of the base of the wall and then disappears, smoothly and silently, under a rock at the foot of the cliff. The largest spring of all stands off by itself and gurgles, in a series of cascades, out of a large opening in a frame of black rock, running across the sink floor in a deep channel and joining the rest of the water where it disappears under the cliff. At least that is what it did do; but there has been a change in the sink floor within the last year, and the last time I was there less than half the volume of water from the black spring was running down the old channel, the rest dis-

appearing in a new spring in the sink floor, just to the left of the water fall. These springs are absolutely independent of climatic conditions above the ground; the flow of water varies greatly, but on my last visit there were more springs than I had ever before noticed and the *Adiantum* cliffs were dripping water, like rain, nothwithstanding that in the surrounding country we had no rain for weeks and the swamps and streams were drying up. When there is plenty of water in the sink is the time to enjoy the ferns. Then one of the most beautiful sights I know is from the bottom of the sink, looking upward at the walls, which are covered from top to bottom in one cascading mass of *Dryopteris normalis*, the fronds four to five feet long and the plants so close together that the graceful, recurving fronds seem to overlap the ones below. *Pteris cretica* grows in dense clumps in the damp places, and here and there one comes on patches of *Dryopteris floridana.* On a series of rock ledges near the top we find *Adiantum Capillus-Veneris*, but these rocks are comparatively easy of access and most of the Adiantums have been carried away. On moss-covered rocks in the canyon bed, which splits the wall on one side, is the dainty little *Asplenium heterochroum*, and along the edge of the canyon I found another *Dryopteris*, with large, broad fronds, smooth and coriaceous, which I have not been able to find in Dr. Small's or any other book. It seemed to be nowhere but in the one small area. I brought home several specimens which are doing well beside my pool.

About ten miles from the sink is a group of rock ledges, which in number of species far exceeds the sink or any other small area I have ever seen. The species I have found and collected there are as follows: *Asplenium abscissum, A. Curtissii, A. heterochroum, A. pumilum, A. verecundum, Dryopteris reptans, D. floridana, D. normalis, Polypodium Plumula, and Pteris cretica.* These

ferns grow on the sheer sides of the ledges or just below them. A short distance away, in the deep, shady woods, is the finest growth of *Asplenium platyneuron* I have ever seen; the fronds measure 24 to 30 inches high and show remarkable variation, being toothed till they are almost once again pinnate. The plants are very dense and heavy, and look very unlike the small specimens commonly found in this section.

On top of one of the ledges are a few outcropping rocks, which are the home, in the United States, of *Asplenium pumilum*. Never are more than a dozen plants of this to be found at one time—seldom that many —and we do not find this dainty, delicate, little fern again any nearer than Mexico and the West Indies. *Asplenium Curtissii* was formerly confused with *A. myriophyllum* of the West Indies, but it is a distinct species and is not found anywhere outside of this lime-sink region. It is a beautiful fern, with delicate, lacy fronds up to 20 inches long, and forms dense mats over large areas of the rock wall. It usually grows with *A. abscissum*, which is a heavier, coarser fern, and the exquisite little *A. verecundum*, which is found also in the southern part of the state and in Cuba. *Dryopteris reptans* is a small fern, compared with our other species of *Dryopteris*, and has variable fronds on the same plant, some being narrowly elongated and rooting at the tip, so that the plants form continuous mats on the rock wall.

From South Florida I secured *Blechnum serrulatum*, *Ceratopteris deltoidea*, *Dryopteris ampla* (our one "tree-fern"), *Adiantum tenerum*, *Asplenium biscayneanum* (a species something like *A. Curtissii* and endemic to the Miami region), *Dryopteris gongylodes*, and *Polypodium pectinatum* from a lime sink near Tampa, a beautiful, slender fern, up to four feet high, with black rachises. *Tectaria heracleifolia* grows from the center of the state southward down into tropical America. It has broad.

halberd-shaped fronds and is very beautiful and distinctive. *Campyloneuron phyllitidis* is another handsome and distinctive fern, having slender, entire fronds with areolate venation. It is found from the central part of the peninsular down into the West Indies. In effect it resembles the simple form of *Polypodium irioides*, and I hope ultimately to produce a crested form of it similar to that of *P. irioides*. I have already several plants with tips divided and forked two and three times.

Having brought home and put under cultivation all the above ferns, I find it is the variation they exhibit which now interests me most. All but a very few show this. Indeed, *Dryopteris normalis* and *D. floridana* are highly variable in the wild state, and *D. normalis* shows two forms, one with all the fronds fertile and densely covered on the under side with the almost woolly sporangia, the other with larger, coarser fronds and a part or all of them sterile until late in the season, much less tomentose, and with fewer sporangia. Excepting *Cheilanthes microphylla*, *D. floridana* is the only outdoor fern I have which was unhurt by the freeze of December 11th, 1934, the other ferns having had all or most of their fronds killed.

For several years I have had a group of *Lorinseria areolata* at the foot of an Oleander tree and have developed fronds so deeply toothed as to be almost again pinnate, though the divisions are wide and rounded, more scalloped than toothed. I do not remember having noticed any forked fronds on this fern.

Athyrium asplenioides is very variable anyway, and I have had several divided fronds. *Dryopteris Thelypteris* shows two forms, one very tall and slender (up to five feet), in shade, and one shorter and relatively broad, in sunny situations.

Last summer I found a Golden Polypody frond so different from the others that I separated that portion of the root, repotted it, and set it in the greenhouse. The

divisions were very narrow and cleft to the rachis. It died back, and I am anxiously waiting to see what it will do.

There is a great deal of difference in the Adiantums, in the shape of the pinnae and the manner in which they are toothed, and in *A. Capillus-Veneris* there seem to be differences characteristic of specimens from various localities. *A. tenerum* so far shows less variation, but I have not had it so long as the other nor nearly so much of it.

Botrychiums do not seem to respond to cultivation so happily as the true ferns and usually die out after a season or two, but one plant which persisted longer developed a frond so deeply divided and laciniated as to bear little resemblance to the rest of its tribe. I cut off the frond and preserved it. The plant itself I took up and potted, but so far it has not "come back."

Most of the rock ferns also show variation, especially *Asplenium Curtissii* and *A. verecundum,* and both of these quickly develop "fish-tail" fronds, sometimes divided three times.

Since building the fernhouse, which is partially shaded by a large Live Oak, I have had to fight slugs and millipeds that breed in the damp leaf-mould, and I lost a great number of valuable ferns before I discovered that I could keep the pests under control by covering the benches with tobacco stems and sprinkling tobacco dust over the top of the soil in the pots. They seemed to attack the rock ferns especially, also *Pteris cretica*, and they killed all of it around my pool. I have one plant left, however, which is flourishing now in a pot in the fernhouse. Near it are several florists' forms of *Pteris*, and my once wild plant is taking on itself the frilled forms of its city sisters and is much heavier than when I found it on the slope of the Devil's Mill Hopper.

I neglected to mention one species that came from near Palm Beach—*Acrostichum aureum.* This is an immense

fern, growing in water, salt or brackish, and requiring full sun. I have had mine two years and obtained it in early spring. As soon as the warm nights came on in summer it began to develop forked fronds and "fishtail" pinnae, some of the fronds being divided from the middle upward and some having as many as nine divisions at the ends. The pinnae divided up to three, usually. The cold weather fronds are always simple.

The most remarkable exhibition of variation I have ever seen is in a plant of the ever-variable *Nephrolepis*. About four years ago I found this growing on the slope of a lime-sink about 20 miles from Tampa. There were three small plants, connected by runners, each plant having two long, lax fronds, ranging to about three times pinnate. It was the only time I have ever seen a "ruffled" *Nephrolepis* in the wild, and I carefully dug up and brought home all three plants. I potted them all together and put them in my greenhouse, later sending one to Dr. Benedict. At that time all my ferns were outdoors, and this was the only one I grew in a pot. The following summer I moved to my present location and, having no greenhouse for a time, kept the fern on the side porch. Here a severe wind and rain storm damaged the fronds so much that I cut them all back, and shortly after put the plant in the newly finished greenhouse. It stayed dormant for some time and then started into new growth, but with utterly different fronds, which instead of being long, lax, and gracefully drooping, were short, somewhat rigid, divided, and redivided, one having 12 divisions. The pinnae, instead of being thin and deeply laciniated, were coriaceous, broad, and entire, except for the fishtail tip. The succeeding (last) year's growth was the same, except that the fronds were much larger and heavier, forked usually two to four times at the end, but having the pinnae divided several times at the tip and much

larger than those of the preceding year. I am anxious to see what it will do this coming year.

In regard to cultivation, I have tried to duplicate natural conditions as far as possible, planting the swamp ferns where they can be watered freely and the rock ferns in shallow soil with a substratum of old broken oyster shell, which insures perfect drainage and gives them lime. For potting soil I drive out to a swamp and find a rotting hardwood log—Oak or Cypress—and dig out a sackful of the rotten and pulverized wood. The epiphytic ferns I pot in this humus, without the shell. I give all of them dairy fertilizer, usually in liquid form, with an occasional dose of ammonia or nitrate of soda. That is, the potted ones; the outdoor ferns don't get much besides plenty of water and the leaf mould in which they are naturally growing under the Oaks.

My first plant of *Cheilanthes microphylla,* given me by my good friend who owns a portion of the island, I placed in the greenhouse, and it died. About a year ago she brought me another precious plant of it. This I planted in a wide shallow pot, in loose sand, in which was plenty of the broken old shell from its native mound, and plunged the pot in the soil in full sun. I water it infrequently, but plentifully when I do. Under this treatment the plant has grown and multiplied, and now I have two or three times as much as I have ever been able to find growing at one time on the whole island.

My plant collection comprises genera and species from practically every warm climate country in the world, as well as many rare native ones, but nothing has ever given me the pleasure that I have derived from the ferns collected from my native state. I would advise every fern student to *grow* them; for aside from the joy of watching the living plants develop, the knowledge gained thereby can never be obtained from dead and dried specimens.

JACKSONVILLE, FLORIDA.

A List of Varieties and Forms of the Ferns of Eastern North America

C. A. Weatherby

(Continued from Vol. 25, p. 95)

Woodsia ilvensis (Linnaeus) Robert Brown, Prodromus Florae Novae-Hollandiae 158 (1810). *Acrostichum i.* Linnaeus, Species Plantarum 1071 (1753).—Blade lanceolate, the lower surface more or less densely covered with narrow scales.

Var. gracilis Lawson, Edinburgh New Philosophical Journal, new series, **19**: 281 (reprint 24) (1864).—Blade narrowly elongate-lanceolate, the lower surface only sparsely scaly. A rare plant, known only where *W. ilvensis* and *W. alpina* both grow and perhaps a hybrid between them.

W. glabella, var. *Belli* Lawson, l. c., appears from the description to be a large state of the species, somewhat transitional to *W. alpina.*

W. obtusa (Sprengel) Torrey, Catalogue of Plants in New York State Geological Report 195 (1840). *Polypodium o.* Sprengel, Anleitung zur Kenntniss der Gewächse **3**: 92 (1804).—Blade broadly lanceolate; pinnae triangular-ovate to triangular-lanceolate.

F. angusta (Peck) Clute, Fern Bulletin **15**: 127 (1907). *W. o.* var. *a.* Peck in Gilbert, List of North American Pteridophytes 39 (1901).—Blade linear-lanceolate ("with fronds 14 in. long, their greatest width is only ½ in."); pinnae also narrower.

Var. *Darlingtonii* Stowell, Journal Trenton Natural History Society **1**: 25 (1887) is a form with acute pinnae and narrowly lanceolate, somewhat acute and deeply lobed pinnules. Stowell contrasts it with the opposite extreme in which the broadly oblong, very obtuse pinnules are little more than shallowly dentate; but there are many intermediate stages and the two do not seem

clearly separable. Var. *Darlingtonii* is, at most, no more than a form.

CYSTOPTERIS FRAGILIS (Linnaeus) Bernhardi, Schrader's Journal **1**, part 2: 26, pl. 2, fig. 9 (1806). *Polypodium f.* Linnaeus, Species Plantarum 1091 (1753).—Rootstock short, ascending or horizontal, or, if somewhat elongate, thickly beset with bases of old fronds, the growing point not projecting beyond the fronds of the season, usually with a conspicuous tuft of scales; fronds rarely more than 8 inches tall; blades pinnate-bipinnatifid, the lower pinnae usually ovate-oblong, about half as wide as long; secondary divisions (at least those nearest the rachis) triangular-ovate to oblong, not narrowed at base, tapering to a blunt tip; indusium glabrous, more or less deeply lobed at the tip (the lobes often not visible unless the indusium is spread out).—Eurasia; in North America from Greenland to Alaska, south to northern New England, the region of the Great Lakes, Missouri and in the mountains to western Texas, New Mexico, Arizona and southern California.

C. fragilis is variable in leaf-outline; in Europe numerous varieties,—better treated as forms—have been described. The following names, or their equivalents, have been applied, probably correctly, to American plants by D. C. Eaton, Lawson, Gilbert, Farwell, and Clute.

F. DENTATA (Dickson) Clute, Fern Bulletin **14**: 120 (1906). *Polypodium d.* Dickson, Fasciculi Plantarum Cryptogamicarum Brittaniae **3**, no. 1, pl. 7, fig. 1 (1793).—Secondary divisions of the blade broadly ovate, very obtuse, with rather shallow lobes (cut no more than halfway to the midrib), which also are obtuse.

F. ANGUSTATA (Hoffmann) Clute, l. c. *Polypodium fragile angustatum* Hoffmann in Roemer & Usteri, Magazin für die Botanik **9**: 11, fig. 14d (1790).—Secondary divisions lanceolate, both they and their lobes acute.

F. LACINIATA (Davenport) Clute, l. c. *C. f.* var. *l.* Davenport, Catalogue of the Davenport Herbarium 34 (1879).—Secondary divisions irregularly cut into linear lobes. This, originally described from Colorado, has been

reported from Michigan by Farwell, Report Michigan Academy of Sciences **18**: 83 (1910). Perhaps not really different from the European "var. *acutidentata.*"

F. **cristata** (Lowe), n. comb. *C. f.* var. *c.* Lowe, Our Native Ferns [British] **2**: 432 (1869).—Tips of the blade and of the pinnae more or less branched.

The American plant has been independently described as *C. fragilis* var. *cristata* Hopkins, Ohio Naturalist **10**: 181, fig. 2 (1910). This was renamed f. *furcata* by Clute, Fern Bulletin **18**: 82 (1910), because of var. *cristata* Lowe, which he considered distinct. The name *furcata* is, however, also preoccupied under *C. fragilis*, having been used by Milde, Nova Acta **26**: 552 (1858). Hopkins's plant has longer and narrower segments than that figured by Lowe and is less markedly crested, but the differences are not great and the American plant may, for the present, be left under Lowe's name.

F. SIMULANS Weatherby, Rhodora **37**: 376 (1935).—Lower pinnae deltoid-ovate, more than half as broad as long, obtuse; secondary divisions not deeply pinnatifid, both they and their lobes obtuse; sori large and conspicuous.

A leafy form, seen only from Missouri, Oklahoma and Texas, striking in its extreme phases and exhibiting a curious association of leaf-form and unusually large sori; but, in the material seen, too ill-defined for varietal status. Its fronds resemble those of small individuals of *C. bulbifera*, for which it has sometimes been mistaken.

F. magnasora Clute, Fern Bulletin **9**: 65 (1901), distinguished by its large sori, might be sought here, but the original illustration does not show the characteristic leaf-outline of f. *simulans*. Clute's form probably belongs with typical *C. fragilis*.

Var. LAURENTIANA Weatherby, Rhodora **28**: 130 (1926).—Similar to the typical *C. fragilis*, but larger, the

fronds up to 18 in. tall; indusium minutely glandular on the back.—In the region surrounding the Gulf of St. Lawrence, from western Newfoundland to Cape Breton Island; Bruce Peninsula, Ontario.

Var. MACKAYII Lawson, Fern Flora of Canada 233 (1889).—Blades usually only pinnate-pinnatifid, the secondary divisions oblong to obovate, narrowed at base, broadly obtuse at apex, widest at or above the middle, often only shallowly toothed; indusium glabrous, tending to be shorter (0.5 mm.) and less deeply lobed than in the typical form, or even entire.—Nova Scotia and southern Quebec to Virginia and occasionally and with various intermediate forms westward to Wisconsin, Illinois, Missouri, and the Black Hills of South Dakota. Almost the only form in southern New England.

This is *Nephrodium tenue* Michaux, Flora Boreali-Americana **2**: 269 (1803) (*Cystopteris Filix-fragilis* var. *tenuis* Farwell); but the name *tenuis* cannot be used for this variety because of *C. fragilis* var. *tenuis* in Milde, Filices Europae et Atlantidis 149 (1867), applied to a different plant. Western plants sometimes approximate the leaf-form of this variety but, so far as I have observed, they have the long indusium of typical *C. fragilis* and should probably be referred to f. *dentata*.

Var. PROTRUSA Weatherby, Rhodora **37**: 373 (1935).—Rootstock long-creeping, only sparsely beset with old frond-bases, the growing point projecting horizontally beyond the fronds of the season ¾ to nearly 2 inches, more or less brown-woolly, but only sparingly scaly; well-developed blades nearly bipinnate-pinnatifid, the wing along the midrib of the pinnae very narrow; secondary divisions triangular-ovate to lance-ovate, broadest near the base, deeply pinnatifid; indusium as in var. *Mackayii*.—Staten Island, New York, south in the Piedmont and the mountains to North Carolina and Alabama, west to Minnesota and Missouri.

CYSTOPTERIS BULBIFERA (L.) Bernhardi, Schrader's Journal **1**, part **2**: 10 (1801). *Polypodium b*. Linnaeus,

Species Plantarum 1091 (1753).—Blades very long and narrow, with long-attenuate bulblet-bearing tips.

F. HORIZONTALIS (Lawson) Gilbert, List of North American Pteridophytes 16 (1901). *C. b.* var. *h.* Lawson, Edinburgh New Philosophical Journal, new series, **19**: 280 (reprint 23) (1864).—Blades triangular to triangular-lanceolate, without attenuate tip. Perhaps only a juvenile or depauperate condition, but sometimes reaching a considerable development and fruiting freely without producing the elongate tip.

PTERETIS NODULOSA (Michaux) Nieuwland, American Midland Naturalist **4**: 334 (1916). *Onoclea n.* Michaux, Flora Boreali-Americana **2**: 272 (1803). (*O. Struthiopteris* and *Matteuccia Struthiopteris* of American manuals, but these names properly belong to the European ostrich fern).—Fertile and sterile fronds separate and unlike; secondary segments of the former much contracted and inrolled, forming very narrow, necklace-like pinnae; rachis of sterile frond glabrous.

F. OBTUSILOBATA (Clute) Fernald, Rhodora **37**: 219 (1935). *Onoclea Struthiopteris,* f. *o.* Clute, Fern Bulletin **18**: 111 (1910).—Fronds variously intermediate between normal fertile and normal sterile conditions.

F. PUBESCENS (Terry) Fernald, l. c. *Struthiopteris germanica* f. *p.* Terry, Fern Bulletin **16**: 5 and 49 (1908). —Rachis with fine, whitish pubescence.

ONOCLEA SENSIBILIS Linnaeus, Species Plantarum 1082 (1753).—Fertile fronds bipinnate, the free-veined pinnules tightly rolled up into berry-like bodies with the sori inside; sterile fronds plane, net-veined, pinnatifid, the few divisions from nearly entire or wavy-margined to deeply cut into oblong, acute lobes.

F. OBTUSILOBATA (Schkuhr) Gilbert, List of North American Pteridophytes 18 (1901). *O. o.* Schkuhr, Kryptogamische Gewächse 95, pl. 103 (1889).—Fronds intermediate between normal fertile and normal sterile conditions, bipinnate or nearly so, the pinnules flat and nearly free-veined, sometimes partially fertile—exactly what one might expect if the normal fertile pinnules were spread out flat.

Var. *bipinnata* Lawson, Edinburgh New Philosophical Journal, new series, **19**: 113 (reprint 13), is, as Lawson himself states, the same as f. *obtusilobata*.

F. **hemiphyllodes** (Kiss & Kümmerle), n. comb. *O. o.* monstr. *h.* Kiss & Kümmerle, Annales Musei Nationalis Hungarici **24**: 88 (1926).—Frond fertile, or somewhat so, on one side, sterile on the other.

GRAY HERBARIUM, CAMBRIDGE, MASS.

(To be continued.)

Ferns of the Vicinity of New York[1]

ROBERT P. ST. JOHN

That Dr. John K. Small, Curator of the New York Botanical Garden, is concentrating his attention on ferns is welcome news to the readers of this journal. During forty years of field experience devoted to general botany he has amassed material which he is now giving to the public in a series of fern manuals. The series, it is rumored, will eventually cover a large part of the United States north of Mexico.

Ferns of the Vicinity of New York, the second volume in this series, is an octavo of 285 pages, printed with customary neatness and accuracy (except for the numbering of the genera from *Thelypteris* to *Pteretis*) by The Science Press, and bound in brown. The cover is stamped with an illustration of ebony spleenwort and a climbing fern appears on the jacket.

A brief history of botanical study in New York City is given in the preface. The introduction is devoted

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[1] Ferns of the Vicinity of New York. Descriptions of fern plants growing naturally within a hundred miles of Manhattan Island. With notes. By John Kunkel Small. (Illustrated). Published by The Science Press, 1935. $2.50.

largely to a discussion of the various plant provinces of the Local Area. The boundaries of each province are located on a section of Fenneman's map of physiographic divisions of the United States, and the fern growth of each and its relation to the prevailing rocks and geological history is made clear.

The taxonomic section treats of eighty-five ferns and fern allies including all ferns known in Connecticut, New Jersey, and Pennsylvania, and all known in New York and New England except a few rare or northern species. Each fern or fern ally is illustrated with a full-page drawing, well executed and of scientific worth, showing, where size permits, the gross appearance and habit, with enlargements bringing out the veining and fructification as well. The latter are represented with much skill, and are clearly the work of an artist competent to depict botanical details of taxonomic significance. Had the limits of the book permitted there might well have been included also drawings of the larger ferns (of which only fragments of the fronds are here shown) showing the shapes of their entire fronds, as an amateur can scarcely visualize such ferns as the bracken and Virginia chain fern from the portions given.

Following the main chapter is a taxonomic list of the eighty-five species of ferns of the Local Area, with citations, by Dr. John H. Barnhart. It gives all synonyms of these ferns likely to be met by readers of modern American fern literature. To all local fern students this will prove valuable both as a taxonomic dictionary of names and as an index to literature. On page 256 the technical names used in this work are compared with those used in Gray's Manual and in Britton and Brown's Illustrated Flora. The glossary and the index are unusually complete. The latter tabulates all names in the numerous habital and taxonomic lists.

As the book is intended primarily for amateurs, the language is non-technical, in so far as possible. Even in the descriptions of genera and species the author attempts, without detriment to accuracy, to use simple words. He prefers rootstock, leaf, blade, and petiole to rhizome, frond, lamina, and stipe.

The keys are founded on minute characters only in those cases, such as separation of the woodsias, where gross characters constant in significance seem to be lacking. To simplify use, families are divided into groups before they are separated into genera. The keys are dichotomous, a form which may tempt the maker to ignore slight lack of conformity to key-groups but which facilitates identification.

Since the book is prepared primarily for amateurs in fern study it might have been well had the author marked the accents of scientific names. Beginners have less hesitancy in the use of botanical names if they receive aid toward pronunciation on first meeting names. Furthermore, it might have been better if the author had further followed Gray's Manual in printing in italics, in the descriptions of species, the most diagnostic characters. Why consider such practice out of date, since nothing better has been used in its place?

The descriptions of species in a popular manual serve two purposes. First, they serve as extensions of the key where specific identification is completed. Secondly, they record a more or less complete set of specific characters for reference. For the latter purpose it may be wise to repeat the same character in the description of several plants in the genus. In such cases it seems best, as an aid to beginners and to facilitate reference, to use some means of emphasizing diagnostic characters. One need not hesitate to follow the leading of Gray's Manual.

This manual of botany was the most usable and consequently the most popular ever produced.

It is true that in the popular accounts which follow the technical descriptions of each species the author does often point out easy means by which a beginner can distinguish a species in the field from others which structurally or superficially resemble it. These popular essays make a valuable addition to the book. They frequently give the common Latin synonyms, the vernacular names, the discovery of the fern, its taxonomic history, the common variations from type, a little about varieties and forms, the geographic and altitudinal range, favored habitats, rock preferences, the maturing of spores, habits of growth, and its performance in the fern garden. These facts are well worth recording. To label such material "bed time stories" savors a little of the closet botanist who studies static structure and neglects characters observable only in the living growing plant.

On page 111 the author gives a list of hybrids between species of *Dryopteris*—and there drops the subject. Sooner or later every student of ferns becomes interested in those critical forms. They are forced on one's attention when making identifications and are interesting because of genetic problems. There may be scant hope of finding a species of fern new to the New York City area, but there is always the possibility of finding an interesting hybrid. Since the author did not care to draw on his broad experience and the pertinent literature scattered through many publications to add an illustrated description of hybrids in the New York area, the task remains for some one else.

In the preface Dr. Small speaks of "untidy genera" that are still maintained in the classifications of some fern students. The changes he proposes, nevertheless, are not so numerous as some would expect. He follows Butters

in placing *Asplenium acrostichoides* Sw. in *Diplazium*, but goes further and assigns *Asplenium angustifolium* Michx. to a separate genus, *Homalosorus*, proposed here for the first time and founded on what are perhaps significant technical and habital characters.

The ferns now commonly considered by botanists under *Dryopteris* he places in two groups, *Dryopteris* and *Thelypteris*, which he maintains are clearly separated by the evergreen or non-evergreen leaves and by the venation of the leaflets. *Dryopteris campyloptera* (Kunze) Clarkson replaces *Dryopteris dilatata* (Hoffm.) A. Gray, as to the plant of eastern North America. He retains *Phegopteris* as a valid genus. In *Equisetum* he recognizes the American *E. praealtum* Raf. as distinct from the European *E. hyemale* L. In *Salvinia* the name *S. auriculata* Aubl. replaces *S. natans* (L.) All., which previous to Weatherby's study was commonly misidentified.

Few will find fault with the changes in taxonomy and nomenclature in *Ferns of the Vicinity of New York*. Whether predestined by priority or indicated by structure and habit, they all seem to be constructive and to bring nearer the time when few changes will be necessary.

As this book is the first fern manual to cover the New York area completely, it will be welcome. Whoever discriminatingly turns its pages will find evidence of a broad acquaintance with botanical problems. The author sees ferns as a section of the plant world and in preparing descriptions is skillful to choose characters of true botanical significance. There is throughout the work a sureness of step sometimes missing in the work of those who limit their study to ferns.

FLORAL CITY, FLORIDA.

Shorter Notes

PTERIS MULTIFIDA POIR. NATURALIZED IN WEST-CENTRAL FLORIDA.—For several weeks during the early spring of 1935 I had the pleasure of hobnobbing with Messrs. R. P. and E. P. St. John, and am grateful to them for a splendid introduction to the fern treasures of their territory, as described by them in their illuminating article in the April–June number of the FERN JOURNAL. On February 27, a short time after their observations were submitted, I discovered a colony of *Pteris multifida* about a mile southeast of Inverness, on the so-called Wildwood Road. in Citrus County. So far as I know, this plant has not been recorded south of Jacksonville. Specimens in abundance covered the perpendicular limestone walls of a large pit beside an orange grove, and just off the dirt road. Only one other fern was found here, that being *Dryopteris normalis*, also growing rankly.

Regarding the origin of the little *Pteris* in this spot, we learned that the pit (some twenty feet long, ten wide, and eight or nine feet deep) was dug about six years ago, the earth having been used in road construction. It seems that the pit had once been used as a dump, which possibly accounts for the presence of the species.—MAURICE BROUN, *Orleans, Mass.*

NOMENCLATORIAL NOVELTIES IN SMALL'S FERNS OF THE VICINITY OF NEW YORK.—By way of supplementing Mr. St. John's general review of this new book, a few notes on certain technical matters seem worth publishing. The book under discussion contains these novel usages:

p. 35. *Pteris* in place of the now usual *Pteridium*. When the Linnean composite genus *Pteris* was being dismembered, Scopoli named the portion of it comprising the brackens *Pteridium*, and has been followed by most recent authors. Small prefers to retain the original

name for this portion, presumably because a representative grew in Linnaeus' region.

p. 77. *Diplazium* in place of *Athyrium* (or *Asplenium*, subgenus *Athyrium*) for the Silver-fern ("Silvery Spleenwort.") This is just a question of what proportion of paired sori must be present to lead to removal of a given species from *Athyrium*. Small considers even a few sufficient; but final decision will require review of the group from a world-wide standpoint.

p. 80. *Homalosorus*, a new genus, in place of *Athyrium* for the Glade-fern ("Narrow-leaved Spleenwort.") This is segregated on the basis of "the even branching of the veins in the leaflets and the termination of the veins and veinlets in the sinuses on the leaflet edge, together with the numerous oblique sori arranged in almost perfectly parallel order." Here too study of the group over a wide area is needed.

p. 85. *Thelypteris* for the Marsh-fern Section of *Dryopteris*. Although from the world-wide standpoint the genus *Dryopteris* is perhaps not divisible, the raising to generic rank of such of its subgenera as can readily be distinguished within the area covered may be regarded as permissible in a local flora.

p. 117. *Phegopteris* retained as genus, in spite of the current tendency to throw it in with *Dryopteris*. The argument of the preceding paragraph holds equally well here.

p. 162. *Botrychium lanceolatum* instead of *B. angustisegmentum*. Based on the belief that "the American plant with narrow leaf segments . . . and the more typical European form [with broad segments] occur within the same range or the same colonies in America." This is contrary to the experience of some recent field workers.

p. 172. *B. multifidum* as the earliest name for *B. "ternatum intermedium,"* or *B. silaifolium*. The relations

between the western and eastern material need further study.

p. 204. *Lycopodium selago* with *L. porophilum* placed in a subgeneric series, *Selagones*, separate from that containing *L. lucidulum*, the *Lucidula*. This is inacceptable to a field worker, for it overemphasizes differences in extent of creeping stem of ecological origin. The so-called *L. porophilum* comprises both lax ecads of *L. selago* and entire-leaved variants of *L. lucidulum*, thus forming a connecting link between them, which has led some authors to consider them only varietally distinct.

E. T. WHERRY.

THE JAPANESE SHIELD FERN.—The following, reprinted, with the courteous permission of the Garden authorities, from the Journal of the New York Botanical Garden for September, 1935, should interest many of our readers. The illustration was kindly supplied by Mr. Daniel T. Walden.

Four specimens of an exotic fern have been growing for many years, unprotected, in the fern garden north of the old rockery. The number of hardy ferns native to the New York region being limited to scarcely more than a dozen satisfactory species, this foreigner should be very welcome in our gardens.

The Japanese Shield Fern, *Dryopteris erythrosora*, bears twice-pinnate broadly triangular blades 15 to 20 inches long on 10-inch dark brown and deeply grooved stipes. The rachis is colored like the stipe; and both, though smooth and brittle in appearance, are thinly covered with dark hairs. The basal and the next two pairs of pinnae are turned outward, as in the Beech ferns, and are 6 inches long × 2 inches broad at the base, tapering rapidly to an acute tip. The pinnules are rounded, very slightly toothed, and decurrent. The indusia are

peltate or reniform, whitish, with a brilliant orange center. They appear close to the mid-vein, and in two rows reaching up to within a half inch of the tip, of each pinnule. The sporangia ripen in mid-July, and by August 1st the remaining indusia are a deep grayish violet color and the exposed sori a shining black. These subsequently change to rusty brown.

The special contribution of this fern to the garden is in the bronzy variegated coloring of the young blades in May and early June. Distinct purplish and cocoa shades occur. At maturity the color has changed to a rich glossy green, showing whitish areas where the heavy sori are depressed from below. The fronds become a bit ragged after August 1st, but new ones appear at this time, of a strong claret color. Spores are borne on the majority of these later fronds, ripening in September. Through the latter part of summer the predominant color is a kind of citron-green. A good companion is the familiar Marginal Shield Fern, which seems very blue-green by contrast.

The plants in the Botanical Garden have been established for many years, and are perfectly hardy. They bear spores prolifically, but the dryness of our summer apparently prevents natural propagation. Young plants have been raised, however, in the Amateur Gardening Classes. The fronds grow from a terminal crown on a thick underground creeping stem, but there has been no increase of plants from the rhizomes.

A NEW FORM OF THE CINNAMON FERN.—At Lake Shehawken, Wayne County, Pa., the writer found a form of *Osmunda cinnamomea* that was so unusual that at first he mistook it for a sterile frond of Clinton's fern. Mr. Weatherby called it a freak form of the Cinnamon fern. As most of these forms are interesting plant de-

Dryopteris erythrosora.

velopments, and are likely to occur elsewhere, I am giving a description of it.

OSMUNDA CINNAMOMEA, forma **crenulata.**[1] Differs from the type as follows: Pinnae obtuse, not acuminate; middle pinnae not longer than basal pinnae; margins of pinnules crenate or crenulate; pinnules of the upper part of the frond congruent, forming irregular lobes; veins of pinnules generally divided farther from the mid-rib; distance between the pinnae one-half greater.

A specimen has been sent to the Academy of Natural Sciences at Philadelphia.

This form is entirely different from forma *incisa* in which the serrations, in plants I have examined, have a mid-rib with its own veinlets, and are found on only a part of the pinnae.

The unusual growth of this new form may be caused by excess moisture and shade, as it grew among thick undergrowth, and so close to the water's edge that it is probably submerged in the early spring.—W. L. DIX, *Trenton, N. J.*

BOTRYCHIUM DISSECTUM AND FORMA OBLIQUUM.—In 1931 and 1932 I marked a number of plants of *Botrychium dissectum* Spreng. and its forms growing in the Indiana Dunes State Park, Porter County, Indiana. I collected fronds from the plants each year until 1934, when "improvements" in the State Park destroyed the most valuable plants.

The experiment included about one hundred plants, representing *B. dissectum* Spreng., *B. dissectum f.*

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[1] OSMUNDA CINNAMOMEA, forma **crenulata**, forma nova. A forma typica differt pinnis obtusis, pinnulis crenatis vel crenulatis; pinnis superioribus tantum irregulariter lobatis, nec pinnatifidiis; pinnis distantioribus. Typus in herb. Academiae Scientiarum Naturalium Philadelphicae.

Osmunda cinnamomea, forma crenulata.

obliquum (Muhl.) Fernald, *B. dissectum f. oneidense* (Gilbert) Clute, *B. dissectum f. elongatum* (Gilbert & Haberer) Weatherby and many intergrading forms. However, the most important results were reached in the changes of *B. dissectum* and *B. dissectum f. obliquum*. Therefore, I shall not consider the other forms here except to remark that succeeding fronds of the same plant were identical in very few cases.

Of the twenty plants of *B. dissectum f. obliquum* I had marked, eight changed to a more simple leaf form, and one changed to *B. dissectum*. Two did not change at all and the other nine changed only slightly. Three of the seventeen plants of *B. dissectum* changed to *B. dissectum f. obliquum* and the others changed slightly within the form.

Due to the short time the experiment was carried on and to the small amount of material, it could not be expected that many plants would change radically. Therefore, even though only three plants changed from *B. dissectum* to *B. dissectum f. obliquum*, and one from *B. dissectum f. obliquum* to *B. dissectum*, I think that this is sufficient evidence on which to base the following conclusions: Since *B. dissectum* changes to *B. dissectum f. obliquum* and vice versa, they cannot be considered as definite and permanent products of evolution; but rather must be considered as fairly distinct types that are likely to be created, one from another, each year.

It is obvious, therefore, that *B. dissectum* and *B. dissectum f. obliquum* cannot be separated into two species.

This is as far as the experimental evidence will allow us to go, but the exact relation between *B. dissectum* and *B. dissectum f. obliquum* ought to be considered: that is, which form is the original and which the derivative?

From a general study of the species one finds that the two forms differ consistently in two and only two re-

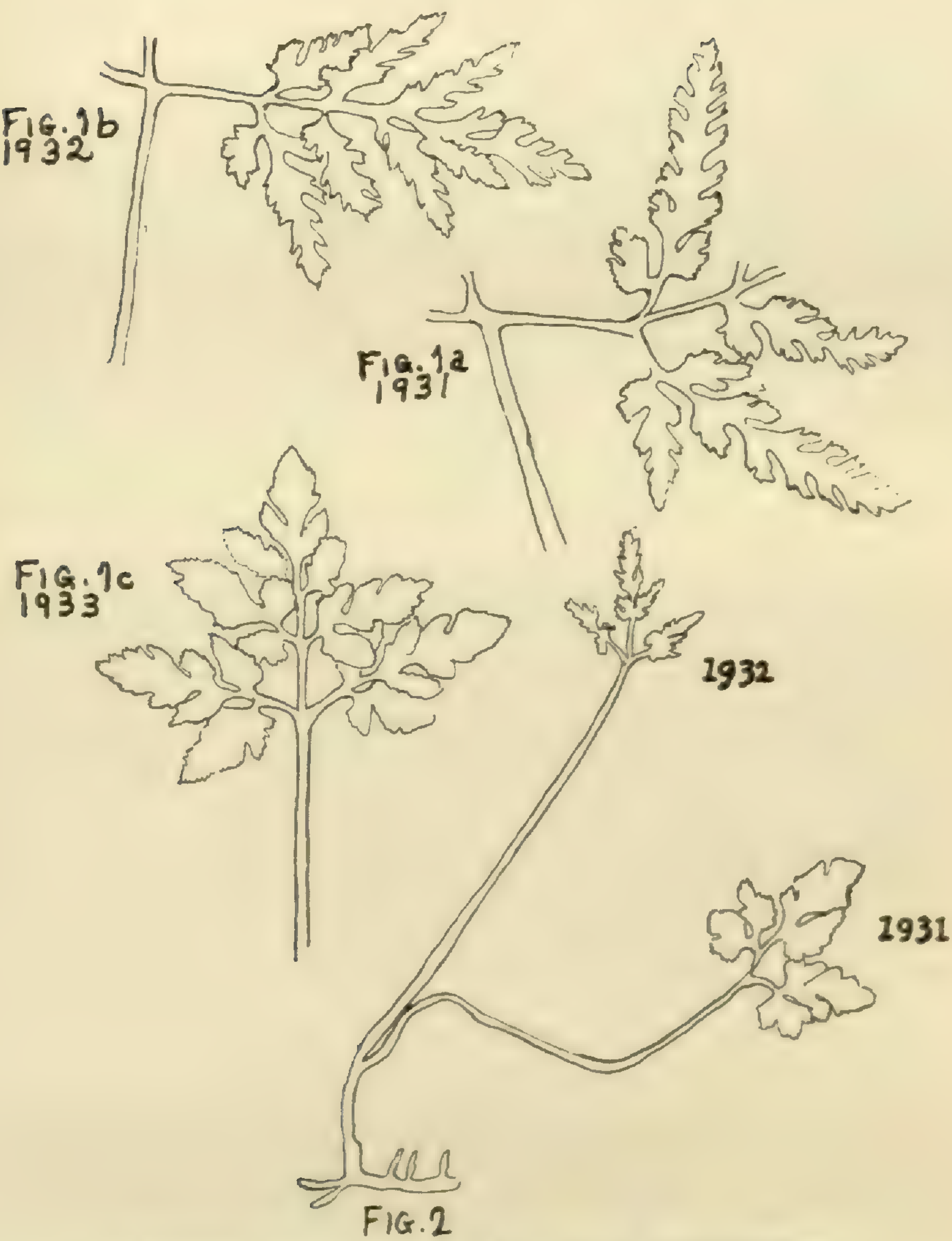

FIG. 2

ANNUAL CHANGES IN THE LEAVES OF BOTRYCHIUM.

spects: distribution and leaf architecture. Considering each of these differences, one can present valid arguments for and against each alternative on the basis of distribution; but on the basis of leaf architecture the evidence points in only one direction.

In the cutting of the frond there is a gradation from *B. dissectum*, many distant lobes on the pinnule, to *B. dissectum f. obliquum*, few or no lobes on the pinnule. Bower (F. O. Bower, *The Ferns*, vol. I, p. 85) says: " . . . that in a primitive type of leaf construction the segments resulting from distal branching were separate laterally one from another; but that by progressive webbing they became coherent laterally to form broader expanses in later and derivative types." Therefore we may conclude that by a process of fusion of the distal lobes, *B. dissectum f. obliquum* has been derived from *B. dissectum*.—R. M. TRYON, JR., *Chicago, Illinois.*

American Fern Society

Report of the President for 1935

The most notable event of the past year has been the completion of the 25th volume of this JOURNAL with the issue of No. 4 on December 28, 1935. The first number appeared on August 16, 1910, and a second four months later, both being privately financed by a group of members. Early the following year the JOURNAL was adopted as the official organ of the American Fern Society, and four numbers have been issued each year since. The average number of pages has been 137 per volume, and the total to date 3,432. In order to give us wider publicity, a notice of this achievement has been sent to *Science*.

The convenience of a collective index is so great that the President has undertaken to have one prepared, and

it will be published as soon as practicable. There will be no expense to the Society for its compilation, but its publication will require a large share of our income for the current year. It will be sold at the lowest price which seems practicable, and all members are urged to make an effort to help the Society out by purchasing copies, as well as by completing their back files of the JOURNAL.

Our 1925 membership list shows a total of 325 names, and the following geographic summary may be of interest. New York claims the largest number of members, 68, Massachusetts with 55 coming second. Then follow Pennsylvania (28), New Jersey (17), California (16), Ohio (12), District of Columbia (11), and Florida (10). Twenty-five additional states show one to nine members each, but in sixteen states we have no members at all. There must be many people interested in ferns in these as well as in the earlier-listed states, who would come into the Society if they knew of it, and it is earnestly hoped that our members will continue to urge their friends and correspondents to join.

EDGAR T. WHERRY, *President*.

Report of the Secretary for 1935

Two meetings of the American Fern Society took place during 1935. The Society's Field Day was held in conjunction with the Torrey Botanical Club, under the direction of Dr. Benedict and Dr. Svenson, of the Brooklyn Botanic Garden, at Springdale, N. J., on September fifteenth.

At the annual Convocation of the American Association for the Advancement of Science, held this year at St. Louis, Missouri, the Fern Society's program was given Wednesday afternoon. Dr. Julian A. Steyermark, of the Missouri Botanical Garden, gave a report on the "Ferns and Fern Allies of Missouri," and Professor

Dwight M. Moore, of the University of Arkansas, reported on the "Ferns and Fern Allies of Arkansas." "Notable Range Extension of Ferns in Illinois" was presented by Miss Mary M. Steagall, of Southern Illinois Teachers College.

The Nominating Committee appointed by President Wherry presented a slate for 1936 providing for the continuation of the same officers, who were duly elected. On the same ballot, for the consideration of the membership, were offered six changes in the Constitution, recommended by the special committee appointed to consider such changes. These were all carried unanimously or by a large majority, as reported by the Judge of Elections. The change adopted in Article VI section 4, changing the date of sending ballots from October first to November first, necessitates a corresponding change in the next section,—Article VI section 5,—which reads: "Balloting shall begin October first and end November first." To carry out the obvious intention this should be amended to read " . . . November first and end December first."

When this further change has been approved, the revised Constitution will be printed as a supplement to a number of the JOURNAL, so that each member may have a copy at hand.

The end of the year 1935 finds the Membership List with 325 names. During the year we have lost, through death, three members,—Willard Webster Eggleston, Miss Carrie Hammond Williams, and Walter H. Aiken. There have been a number of resignations, and some names of inactive members have been removed from the list. This accounts in part for the lessened number in comparison with the 350 on our list at the beginning of 1935. During the year thirty new members have joined the Society, compared with thirty-seven in 1934.

Some analysis of the membership may be of interest. Of the nine Charter Members and those who joined in 1893,—the year the Linnean Fern Chapter of the Agassiz Association was formed,—there are still three active members with us. Three of those who came in during 1897 are also still on the List. Each year from 1893 to 1898 has at least one representative of those who joined during that year. 1899 and 1900 are not represented. From 1901 to 1909, inclusive, each year has from one to three represented in the present membership.

In 1905 the name was changed to the American Fern Society, and in 1910 the AMERICAN FERN JOURNAL superseded the *Fern Bulletin* as the official publication. 1910 and 1911 seem to have been years of greatly increased membership; for we still have six who came in during 1910 and fourteen for 1911. Of those who joined during the years through 1911, about thirty-five, or one-tenth, of the present membership have been in the Society for twenty-five years or longer. Many of these have devoted years of service in one capacity or another to the business of the Society, and we may well take this opportunity to say to each of them "Greetings!" and "Good Health!"

Respectfully submitted,

ELSIE GIBSON WHITNEY, *Secretary*.

Report of the Treasurer for 1935

RECEIPTS

Cash on hand, Jan. 1, 1935			$167.89
1934 subscriptions—arrears		$ 10.30	
193[illegible] " —renewals		61.14	
1935 " —new		13.75	
1936 " —renewals		38.95	
1936 " —new		3.75	
1934 memberships—arrears		31.50	
1935 " —old		354.10	
1935 " —new		42.00	
1936 " —old		15.75	
1936 " —new		4.00	
Advertisement in FERN JOURNAL		4.00	

Sale of back numbers of FERN JOURNAL	112.97	
Gifts	39.67	
Reprints	35.10	
Sale of hart's-tongue fern	6.00	
Discounts on engraving, Science Press	22.23	
		795.31
		$963.20

DISBURSEMENTS

Science Press, vol. 24, no. 4 of FERN JOURNAL	$ 94.14	
" " " 25, " 1 " " "	92.55	
" " " 25, " 2 " " "	116.43	
" " " 25, " 3 " " "	124.55	
" " envelopes	10.98	
" " reprints	47.84	
Payments on loan	200.00	
Agency commission—subscriptions	7.54	
Bank charges (to Nov. 30)	.45	
Refund to T. N. McCoy	.35	
Returned checks—faulty endorsement	2.20	
Sale of hart's-tongue fern—postage	2.21	
Expense, Secretary	39.14	
" Treasurer	32.23	
" Curator	1.55	
		772.16
Cash on hand, Jan. 1, 1936		$191.04

FINANCIAL STATEMENT, DECEMBER 31, 1935

ASSETS

Cash on hand	$ 191.04
Cash in closed bank	12.40
Notes Receivable	3,200.00
Accounts Receivable, Reprints	23.33
1934 Memb. Receivable	38.79
Inventory, AMERICAN FERN JOURNAL	607.17
	$4,072.73

LIABILITIES

Capital Account	$3,702.62
Notes Payable	200.00
1936 Subs. Renewed, Suspense Account	38.95
1936 Subs. New " "	3.75
1935 Memb. Payments, Suspense Account	107.66
1936 Memb. Payments, " "	19.75
	$4,072.73

During 1935 the Society received as gifts the sum of $39.67. Of this amount, $18.50 was donated by one of

our members who asks that his gifts remain anonymous. (It may be added here that the same member has made a contribution for 1936.) Payments by two members of engraving costs of articles published in the JOURNAL account for the remainder of this sum. The treasurer feels that the outstanding debt ($200.00) should be paid, if possible, during the coming year. This amount represents part of the loan of $500.00 made to the Society in 1933 through the generosity of one of its members. Payment of $300.00 has been made since that time. When this loan has been repaid, it is hoped that the present "emergency" will be over and that the funds of the Society can again be segregated into the Emergency Fund, General Fund, and Special Permanent Fund, an arrangement long ago accepted for the Society. "All current expenses should be met from regular receipts and . . . the income from the sale of back numbers of the JOURNAL . . . be set aside as a reserve fund, to be expended only in case of emergency, and if not thus expended, at the close of the year, to be placed in the Permanent Fund for which our constitution now provides." (Report of the President, AMERICAN FERN JOURNAL, vol. vii, 21 (1916).)

HENRY K. SVENSON, *Treasurer.*

Report of the Editor for 1935

The completion of the 25-year period in the life of an individual or an institution, such as matrimony, is usually the occasion for some special celebration. The American Fern Society took to itself as a partner the AMERICAN FERN JOURNAL 25 years ago.

The first year and some of the succeeding early years constituted a period of experimentation and adjustment. The FERN JOURNAL was definitely a new venture and many things were uncertain. After a few years, however,

matters became definitely stabilized, and as the years passed the problems of the editors, beginning each new year, have remained essentially the same. There have been periods when there was a great dearth of manuscript in the copy drawer and others when there was a plenitude. On the whole, the editors have had a pleasant and relatively easy task. Members have been decidedly lenient in the judging of editorial mistakes and delinquencies, and the association, among the editors and with the members, has been very pleasant.

Looking forward to the 26th volume,—shall we say to the second twenty-five years of the FERN JOURNAL,—the editors, whoever they may be, cannot ask more than has been accorded in the past,—a rather wide-spread interest and communication on the part of the members, occasional assistance with the extra expenses of illustrations, and a tolerant attitude for the occasional mistakes which editors are bound to make.

Report of the Judge of Elections

Nov. 15, 1935

Mrs. Elsie Gibson Whitney,
Secretary of the American Fern Society,
New York State Museum,
Albany, N. Y.

My dear Mrs. Whitney,

110 ballots were returned. There was one additional ballot, postmarked November 2, 2:30 P.M., which I did not count.

The tabulation is as follows:

For President—Dr. Edgar T. Wherry	101
For Vice-President—Mrs. Carlotta C. Hall	102
For Secretary—Mrs. Elsie Gibson Whitney	101
For Treasurer—Dr. Henry K. Svenson	102

Amendments to the Constitution,

Article IV, Sec. 2	110
Article IV, Sec. 5	110
Article VI, Sec. 1	108
Article VI, Sec. 2	107
Article VI, Sec. 4	107

One ballot substituted the name of C. A. Weatherby for President.

As Judge of Elections I declare the regular ballot elected: Dr. Wherry for President, Mrs. Hall for Vice-President, Mrs. Whitney for Secretary, Dr. Svenson for Treasurer, and the Amendments adopted.

Respectfully submitted,
LOUISE F. A. TANGER, Judge of Elections

THE JOINT FIELD TRIP OF THE AMERICAN FERN SOCIETY AND TORREY BOTANICAL CLUB, SPRINGDALE, NEW JERSEY.—On September 15, 1935, members of the American Fern Society and the Torrey Botanical Club met at 10 A.M. at Springdale, near Newton, New Jersey, for a joint field trip. Dr. Benedict led the party to Muckshaw Swamp, where rich and extensive marsh land, dissected by ridges of limestone, formed a terrain favorable to the growth of ferns and many other interesting plants. Several fern hybrids were located, among which were *D. Goldiana* × *marginalis* and various crosses in the *spinulosa* group.

After luncheon, at the "Big Spring," and an informal meeting of the Fern Society, in which the financial outlook and the Society's herbarium were discussed, the company drove to the humus swamp northeast of Newton, where quite different but equally interesting marsh plant-associations were encountered.

The following registered as present at the outing:

Anderson, G. P.
Benedict, R. C.
Bowman, F. Willard
Chute, Hettie M.

Dix, W. L.
Dole, W. H.
Dunbrack, Winifred J.
Judd, Mr. and Mrs. G. F.
Marsh, Mr. and Mrs. Spencer S.
Merriman, M. C.
Nestler, H. A.
Oberer, William F.
Rosenberg, Theresa
Rusk, Hester M.
Schiffman, Abraham
Small, Florence M.
Small, John A.
Smith, Ira B.
St. John, Mr. and Mrs. R. P.
Streeter, Stella G.
Svenson, Mr. and Mrs. H. K.
Trudell, Harry W.
Wherry, Edgar T.
Wilkens, Miss A.
Wilkens, Hans

—ROBERT P. ST. JOHN.

HUNTING FERN HYBRIDS NEAR NEWTON, N. J.—Supplementing Mr. St. John's account of the September field trip, a few additional notes may be of interest. The selection of the Newton region was the result of an isolated bit of information dating back some thirty years. About that time, my interest and knowledge regarding *Dryopteris* hybrids were considerably enhanced by contacts with Dr. Philip Dowell. With him, I visited a number of localities near New York City in search of possible hybrids. Considerable time was spent also in the study of herbarium material at the New York Botanical Garden which he had collected.

One of the most interesting plants, *Dryopteris Goldiana* × *marginalis*, was reported by him from Newton, New Jersey. The locality remained merely the name of a town until this year. With Dr. Svenson, I had made two or three annual Election Day trips into Sussex County where Newton is located and had looked about for a large swamp in the Newton region but without finding it. Finally, in connection with the Torrey Club field meeting in May, with headquarters in Branchville, N. J., one of the trips took us to Muckshaw Swamp, a few miles south of Newton. Here *Dryopteris Goldiana* was found in considerable abundance, although no hybrids were located at that time.

The September trip had already been scheduled and I was convinced that the region was probably visited by

Dowell thirty years before. In his notes on "New Ferns described as Hybrids in the Genus Dryopteris" (Bull. Torrey Club, Vol. 35, 1908), he says: "About a score or more plants of this fern were found along the edge of a large swamp west of Springdale, near Newton, New Jersey, on July 4, 1907, *Dowell 4931*, type. On July 22 another plant (No. 5035) of this fern was found in a different part of the swamp."

On the recent September trip, the first example of a hybrid found was a single plant growing on sloping talus, perhaps eight feet above the swamp level. Further along, Mr. and Mrs. Marsh ran across a colony of perhaps thirty or forty plants. It would appear probable that this latter station is the same as the one from which Dowell reported "about a score or more plants." Whether the other single specimen is the same as seen by him may be questioned. The large number of plants in the one spot is a matter of great interest since these *Dryopteris* hybrids have not been found to be fertile on earlier examination.

Herbarium and living plant material were collected and the latter transplanted to a favorable situation in the Brooklyn Botanic Garden. Studies are under way of some of the critical characteristics of the putative hybrids and the probable parents. It has previously been noted that the indusia of some of these species present distinctive cell characteristics which can be used in checking the identity of a possible hybrid. The different scale characters may probably also be relied upon.

On October 12 of this year, another visit was made to the same locality. The differential effect of early frosts was interesting to note. Nearly all the plants of *Goldiana* affinity showed more or less breakage or discoloration. A large quantity of leaves of *D. Goldiana* × *marginalis* were collected and have been pressed as herbarium specimens.

Dowell's paper cites another *Goldiana* hybrid, *Clintoniana* × *Goldiana*, as collected in the same region. The September trip did not bring forth anything clearly identified as this form, but other summers are coming and another Society fern trip to the same place is now suggested.

The particular swamp where these plants grow is part of a large, private, restricted tract. Sincere appreciation is hereby expressed to Mr. Augustus Whittingham for the opportunity to visit the locality.—R. C. B.

Dr. Everett G. Logue wishes to obtain, either by purchase or exchange, spores or living plants of *Polystichum acrostichoides* var. *gravesii*, var. *lanceolatum*, or any other noteworthy variant of this species. Members interested should address Dr. Logue at the First National Bank Building, Williamsport, Pa.

New members:

Constantine, Thomas S., 793 East 169th St., New York City.
Curry, Mrs. E. Norman, Litchfield, Conn.
Lee, Edward, Dept. of Botany, University of California, Berkeley, Cal.
Vecchierello, Rev. Dr. Hubert, St. Bonaventure College, St. Bonaventure, N. Y.
Whitehead, Jack, Boyce Thompson Southwestern Arboretum, Superior, Arizona.
Yang, Mrs. M. S. (Yang Chen Gin O), Fukien Christian University, Foochow, China.

Changes of address:

Bill, Mrs. G. E., c/o Mrs. Poor, Old Meadows, Beverley Farms, Mass.
Clausen, Robert T., Bailey Hortorium, Sage Place, Ithaca, N. Y.
Darling, Cyrus, Box 103, Westboro, Mass.
Delafield, Mrs. John R., 17 East 79th St., New York City.
Little, Elbert L., Jr., Box 443, Globe, Ariz.

A field meeting of the Society is being planned for Sunday, June 20th, to see the Scolopendrium and other notable ferns around Syracuse, New York. Details will be announced later. We hope also to have another joint meeting with the Torrey Botanical Club in September.

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Vol. 26 April-June, 1936 No. 2

American Fern Journal

A QUARTERLY DEVOTED TO FERNS

Published by the

AMERICAN FERN SOCIETY

EDITORS

R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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Council for 1936

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Matter for publication should be addressed to R. C. Benedict at 1819 Dorchester Road, or Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, N. Y.

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L. S. HOPKINS ..... Culver-Stockton College, Canton, Mo.

A regular loan department is maintained in connection with the Society herbarium. Members may borrow specimens from it at any time, the borrower paying all postal or express charges. The pages of the Journal are also open to members who wish to arrange exchanges; a membership list is published to further assist those interested in obtaining specimens from different localities.

American Fern Journal

VOL. 26 APRIL–JUNE, 1936 NO. 2

Rare Ferns of Central Florida

EDWARD P. ST. JOHN

I. SOME PECULIARITIES OF DISTRIBUTION

The Florida peninsula, which is from 100 to 150 miles in width, extends southward between the Atlantic Ocean and the Gulf of Mexico nearly 400 miles. A chain of low islands of rock, the Florida Keys, carries the shore line forty or fifty miles farther south. From Key West to Cuba the distance is only about 100 miles.

The southern quarter of the peninsula forms a distinct phytogeographic region. It includes the Florida Keys; the Everglades, a marsh of 3,000,000 acres within which are the Everglade Keys, a few small, slightly elevated rocky areas; and the Big Cypress Swamp, which lies west and north of the Everglades and has an area of 1,500,000 acres. No point in this whole region reaches an elevation of fifty feet above sea level. The atmosphere is moist, and the jungle growth on the islands and in the drier parts of the swamps provides shade and shelter from salty and drying winds. Frosts occur only at long intervals.

The flora of the Florida Keys, the Everglade Keys, and the region about Cape Sable at the southern tip of the peninsula is strictly tropical, and tropical elements abound in the swamps. To illustrate, the region has ten species of native palms, and epiphytes are very abun-

[Volume 26, No. 1 of the JOURNAL, pages 1–40, plates 1–3, was issued April 4, 1936.]

dant, and include twenty-six species of orchids and sixteen bromeliads. Over fifty species of tropical ferns are found here, while only two or three species of northern origin are known to be present.

In the northern half of the peninsula, separated from the area described above by well toward 100 miles of sandy pinewoods and flooded cypress swamps in which but few species of ferns are found, lies a very different region. It is about 150 miles in length from north to south, and about 75 miles in width. It borders the Gulf of Mexico on the west, and covers about two-thirds of the width of the peninsula at that point. The climate is distinctly colder than that of the region described above: at least a few frosts occur each winter, and occasionally the temperature drops eight or ten, and rarely fifteen, degrees below the freezing point. Along the Gulf coast and the larger rivers are "hammocks" (forests of broad-leaved trees) which somewhat approach the general character of those of the Everglades and the Big Cypress Swamp, but there is much less of the jungle aspect, and northern types of trees and shrubs greatly predominate. Except in the Gulf hammocks the land is more elevated, rising to 300 feet in the higher hills, and drainage is good. In large areas underground water systems by which the rainfall passes rapidly through the sandy soil to subterranean channels in the limestone rock make it far too complete, especially since during the colder half of the year droughts are frequent. Rock outcrops are abundant and there are many "sinks" with rocky walls.

The flora is largely subtropical. Five species of palms grow without cultivation, and four epiphytic orchids and eight bromeliads are found at least in the southern part. Various other tropical groups are represented, but with such plants are a much larger number of species and individual plants of oaks, ashes, hickories, maples, plums, hawthorns, viburnums, etc. But when the fern flora is

investigated surprisingly different conditions appear. Of the 69 species of native ferns and fern allies which the writer has here collected during the last three years more than five-sixths are tropical, or are endemic to the region and are tropical in relationship.[1]

When the distribution of these tropical ferns is examined in detail very unusual conditions are discovered. First among these is the presence of a remarkable group of endemic species. Second is the fact that a considerable number of tropical species are represented in the United States only by their presence in this region which is not tropical. Third, the distribution of many of these species is extremely local. Fourth is the fact that nearly one-half of the species of tropical ferns that are found in this central Florida region and in the West Indies are not found in the southern Florida region, which lies directly between and where the climate and flora are tropical. A more detailed statement of these facts follows.

The endemic species are:

1. *Ophioglossum floridanum* E. St. John
2. *Asplenium Curtissii* Underw.
3. *Thelypteris macilenta* E. St. John
4. } Three newly discovered Aspleniums as yet unpublished
5. }
6. }

Species which are widely distributed in the West Indies and in continental tropical America, but which are not found in the tropical region of southern Florida or elsewhere in the United States except in this limited area are:

1. *Hypolepis repens* (L.) Presl
2. *Blechnum occidentale* L.
3. *Asplenium auritum* Sw.
4. *A. pumilum* Sw.
5. *A. cristatum* Lam.

---

[1] At least five other tropical ferns are found in this region, but under circumstances that suggest introduction by human agency.

6. *Thelypteris panamensis* (Presl) E. St. John[2]
7. *T. subtetragona* (Link) E. St. John[3]

Besides these there is a group of ferns which are found in the West Indies, but not in southern Florida, which appear in central Florida and farther north, the implication being that the northward migration in the eastern United States was from the central Florida region. These are:

1. *Adiantum Capillus-Veneris* L.
2. *Asplenium resiliens* Kunze
3. *A. heterochroum* Kunze
4. *Thelypteris dentata* (Forsk.) E. St. John[4]
5. *Trichomanes Petersii* A. Gray

Perhaps this list should be increased by the addition of *Pycnodoria cretica* (L.) Small which is widely distributed over fully half of the area which is under discussion with conditions that strongly suggest a waning native species rather than an exotic that was introduced during the last 150 years.

Altogether, eighteen species show these peculiarities of distribution. In connection with many of the individual species the facts have been commented upon by botanists. but apparently have not been so collated as to reveal their full significance. To the writer, engaged in the study of the ferns of this particular region, it seemed certain that the same fundamental causes must account for all of these similar phenomena, and that only important geological and climatic changes would be sufficient. The belief seems to be amply justified.

It is well known that the Florida peninsula is of comparatively late geological origin. Prof. Charles Schu-

[2] **Thelypteris panamensis** (Presl), n. comb. *Nephrodium panamense* Presl, Rel. Haenk. 1: 15. 1825.

[3] **Thelypteris subtetragona** (Link), n. comb. *Polypodium subtetragonum* Link, Hort. Berol. 2: 105. 1833.

[4] **Thelypteris dentata** (Forsk.), n. comb. *Polypodium dentatum* Forsk., Fl. Aegypt. 185. 1775.

chert, the outstanding authority on the geological history of the region that surrounds the Gulf of Mexico, has shown[5] that as late as the upper Eocene the whole of what is now the state of Florida was submerged. During the Oligocene an island emerged which occupied the exact position of the region which is under discussion, but which extended beyond the present coast lines at the east and the west. Considering the general climatic conditions at that period and the fact that the warm waters of the tropical sea flowed north of this island, it seems certain that its flora was wholly tropical. Doubtless it was of West Indian origin and very rich in ferns. In the light of present conditions in those islands it seems hardly possible that the number of species of ferns could have been less than several hundred. Prof. Schuchert believes that this island, varying in size at different periods, persisted for at least 12,000,000 years before connection was made with the mainland. This long period of isolation, with changes in climate and other ecological factors, accounts for the development of the endemic species.

During the Miocene the eastern half and the western border of this island were submerged, making its area correspond with startling exactness to that of the phytogeographic region described above. At about the same geological period the emergence of the northern half of the peninsula connected it with the mainland, making northern migrations possible while tropical conditions still prevailed in the southern part of the continent, thus accounting for the third group of species mentioned above. Not until the Pleistocene did the southern half of the peninsula and the Florida Keys appear. The implication of such geological information as is available to

[5] *Geological History of the Antillean Region*, Bulletin of the Geological Society of America, Vol. 40, pp. 337–360, March 30, 1929.

the writer seems to be that the emergence began at the north and extended southward. It seems clear that this ancient tropical-island region was at least the principal center of distribution of tropical ferns in Florida, southward as well as northward. Thirty species of the Oligocene island region are also found near the southern end of the peninsula.

During the Pleistocene the successive glacial periods sent waves of colder climate southward, introducing some strictly northern species, a few of which still remain in very small numbers in a few scattered colonies. During the glacial invasions, or possibly at a later period when the present climatic conditions were established, the great majority of the tropical species were exterminated by the colder temperatures as far south as central Florida, as is indicated by the great predominance of northern flowering plants at the present time. The tropical ferns that are now isolated in central Florida are the wreckage of the once far richer flora of the Oligocene island. They are the species that failed to migrate southward, but which were sufficiently hardy or adaptable to maintain themselves in a now uncongenial climate in a few stations where conditions are unusually favorable. This theory, together with some unfavorable effects of human occupation of the area, affords general explanation of the fact that nine of the seventeen species listed above are each confined to areas of a few square miles and seven of these to stations which are much more circumscribed.

This explanation seems to meet the demands of major peculiarities of distribution in central Florida and further north, but mention should be made of some apparent exceptions to the rule. The present distribution of two species, *Ophioglossum Engelmanni* and *O. crotalophoroides*, seems to indicate that they reached Florida and the adjacent states at the north by way of Mexico.

Adiantum Capillus-Veneris appears to have migrated northward both by way of Florida and by way of Mexico. If this is true it is probable that comparison will show differences between the two strains.

Further consideration should be given to certain ferns of the southern Florida region. In addition to the thirty species that are found in it and also in central Florida there are twenty-four species that are not found in the Oligocene-island region. If the theory that has been outlined above is to be rigidly followed these ferns migrated southward from the island region and were later exterminated in the more northern area by the subsequent climatic changes. Such an extermination offers no difficulties: it is likely that five times that number of species suffered such a fate. But in the absence of detailed evidence as to the history of the development of the southern half of the peninsula the present 100-mile barrier of almost fernless country that lies between the regions may seem to discredit the possibility of such a migration.

Grouping the species in question according to what seem to be their essential ecological requirements reveals seventeen species, terrestrial and epiphytic, which occupy the low hammocks and their borders, and seven that are epipetric. Considering the first group it is to be remembered that some small isolated hammocks are scattered through the intervening area, and that low coastal hammocks still reach out from each of the regions toward the other. There is reason to believe that in the past they made complete connection. Also, it is known that, in some parts of the state at least, pinewoods have replaced hammocks of an earlier period. It seems quite probable that in the past suitable conditions for the growth of the hammock ferns existed over much of the intervening area.

As to the former presence of outcropping rock with suitable conditions for the growth of ferns the evidence is not quite so clear. No statements of geologists that have direct bearing upon the subject have been discovered. It seems significant that of the eighteen tropical ferns that failed to make the southward journey eight are epipetric, while two or three others usually grow in close proximity to rocks. But, on the other hand, ten of the thirty tropical ferns that are common to central and southern Florida are likewise epipetric. Also, the close relationship of *Asplenium biscayneanum*, an endemic species of the southern region, to *Asplenium Curtissii* and to two others of the endemic species of the northern area implies a direct connection between the two regions. It is very likely that a part of the eight rock-haunting ferns that are absent from central Florida, and perhaps some of the ferns of the low hammocks, were introduced directly from the West Indies by wind-blown spores. The presence on the Florida Keys of *Paltonium lanceolatum* (L.) Presl, which is not found on the mainland, is confirmatory of such a belief. As to the majority of the twenty-four species it seems far more likely that the migration was by land in short stages, during several hundred thousand years of time, than that it was an unbroken journey over the sea of considerably over one hundred miles.

The conclusions outlined above are far from exhausting the significance to students of American ferns of the geological history of the region about the Gulf of Mexico. A comparison of the fern flora of the southwestern United States with that of the southeastern states, and of both of these with those of the West Indies, Central America and South America suggest many major problems of distribution, the solutions of which will be found in the story of the nature and the succession of the straits

Florida at Present and the Position of the Oligocene-Miocene Island.

that formerly separated Central America from South America and from Mexico, and of the land bridges which at times connected that region with the West Indies and with the continents at the north and the south, together with the attendant and succeeding climatic changes.

CONWAY, N. H., AND FLORAL CITY, FLA.

EXPLANATION OF THE MAP

Showing in outline the position of the Oligocene-Miocene island and the location of the principal and outlying station of tropical ferns which are isolated in central Florida at the present time.

1, 2.	*Thelypteris panamensis*
2, 4, 5.	*Hypolepis repens*
3.	*Asplenium auritum*
6, 8.	*Blechnum occidentale*
7, 15.	*Thelypteris subtetragona*
8.	*Thelypteris macilenta*
8.	*Trichomanes Petersii*
9, 14, 17.	*Asplenium Curtissii*
10, 13.	*Campyloneuron Phyllitidis*[3]
11.	*Asplenium cristatum*
12.	*Asplenium* ——— n. sp.
12.	*Asplenium* ——— n. sp.
12.	*Asplenium* ——— n. sp.
12, 13.	*Anemia adiantifolia*
16.	*Ophioglossum floridanum*
17, 8.	*Asplenium pumilum*

New Ferns of Central Florida

EDWARD P. ST. JOHN

THELYPTERIS **macilenta,** n. sp. Rootstock short, horizontal, rather copiously scaly; scales narrowly lanceolate, acuminate, glossy, brown, ciliate, 2–3 mm. long, with up to 14 rows of elongate, rather thin-walled cells, with lumina moderately translucent and about 4 times as long as broad; leaves clustered, few, erect, 1.5–4.5 dm. long; petioles stramineous, finely pubescent with pale hairs, copiously scaly at base; blades narrowly elliptic to ellip-

[3] Found also in southern Florida, but not in the intervening region or further north.

Thelypteris macilenta L. St. John
Annuttalagga Hammock
Hernando County, Fla.
1934.
L P St John

tic-lanceolate, acuminate, sparingly pilose, once pinnate; pinnae 15–20 pairs, elliptic or nearly so, decidedly narrowed at the base, 1–3.5 cm. long, the upper ones spreading, the lower deflexed, the lowest three or four pairs thrust forward nearly at right angles to the plane of the middle of the blade, pinnatifid, with the midrib and midveins of the segments often sinuous; segments mostly ovate, oblique, obtuse, shallowly undulate; veins only 2–4 pairs to the segment, oblique, simple; sori very few, usually only 2 or 3 to a segment, inframedial; indusia sparingly pilose[1]. (Plate 5.) In a rocky hammock 7 miles northwest of Brooksville, Florida, May 4, 1934, *E. P. St. John*, TYPE in herb. New York Botanical Garden; isotype in herb. E. P. St. John. No other station is known at the present time.

OPHIOGLOSSUM **floridanum,** n. sp. Rootstock subcylindric, very short when young, with greatly elongate roots about 1 mm. in diameter, reproducing freely by suckers, sometimes 8 or more plants on one root-system; leaves solitary or 2–5 together, 1–2.5 dm. tall; foliage-blade often above the middle, glabrous, sessile or with a broad, short, petiole-like base, variable in form and venation but commonly 3–6 cm. long, yellowish-green, rhombic-ovate with rounded or abruptly pointed tip and abruptly narrowed or truncate base; basal veins 5–7, the midrib extending to the apex, the lateral veins diverging and branching near the base and soon indistinguishable among the areolae; 2 rows of large areolae 2–3 times as long as broad on each side of the midrib, and smaller broad areolae between them and the small ones at the margin; included veins few; sporophyll usually shorter than the common stalk; spike 1–4 cm. long, apiculate;

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[1] THELYPTERIS **macilenta,** sp. nov., rhizomate brevi repente copiose paleaceo; paleis anguste lanceolatis 2–3 mm. longis acuminatis nitidis brunneis ciliatus, cellulis elongatis; frondibus subcaespitosis erectis 1.5–4.5 dm. altis; stipite stramineo pubescente, pilis pallidis; lamina elliptica vel elliptico-lanceolata acuminata pinnata sparse pilosa, pinnis 15–20-jugis ellipticis basi angustatis 1–3.5 cm. longis pinnatifidis, inferioribus deflexis, costis costulisque saepe flexuosis, laciniis plerumque ovatis obliquis obtusis leviter undulatis, venulis 2–4-jugis obliquis simplicibus; soris paucis inframedialibus; indusiis sparse pilosis.—Prope Brooksville, Florida, May 4, 1934, *E. P. St. John*, typus in herb. Hort. Bot. Noveboracensis.

sporangia globose, about 1 mm. in diameter, yellow when mature, 7–30 on each side of the rachis; spores pitted, maturing May–November and sparingly through the winter months.[2] (Fig. 1.) Among grasses in a roadside

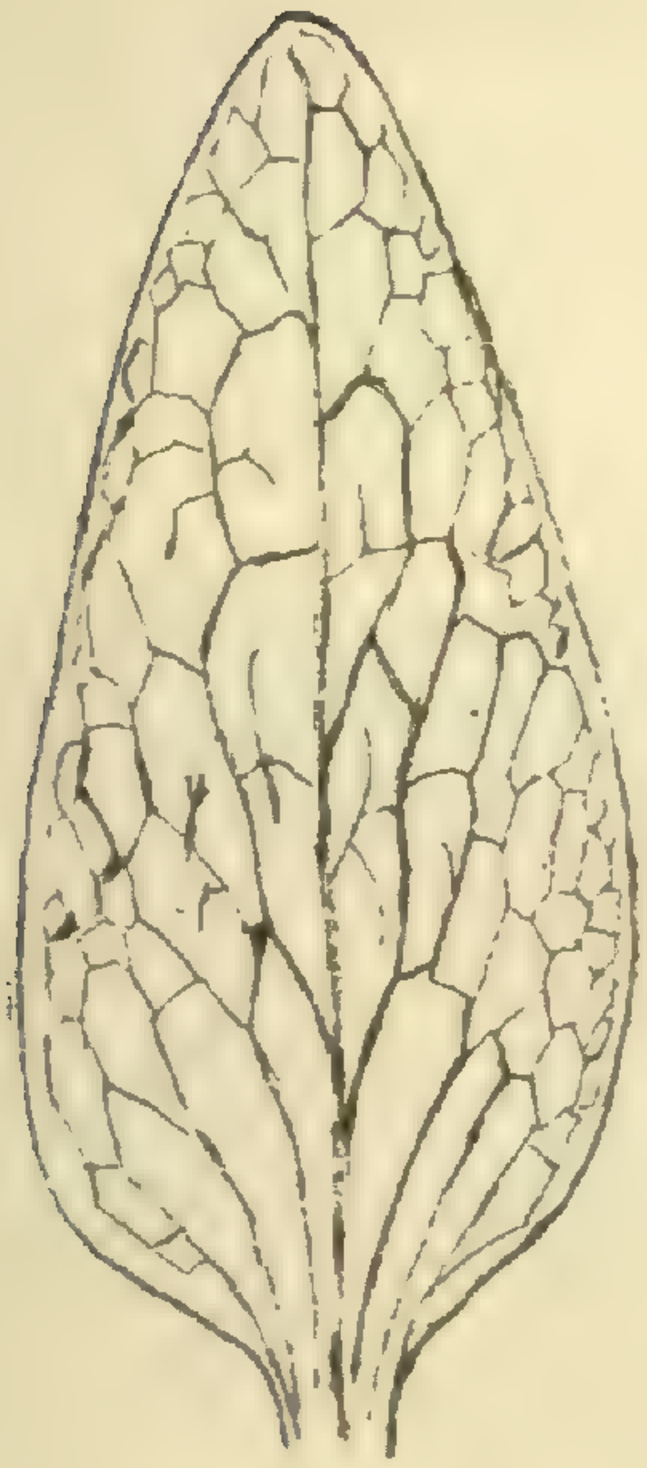

FIG. 1

FIG. 2

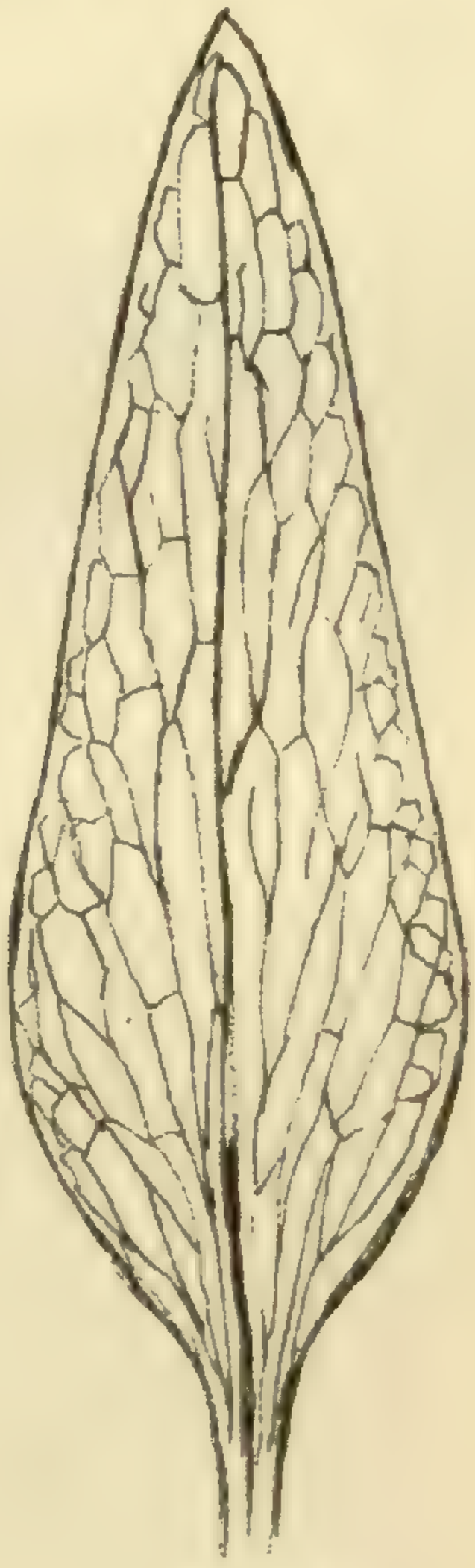

FIG. 3

[2] OPHIOGLOSSUM **floridanum**, sp. nov., rhizomate subcylindrico, radicibus valde elongatis 1 mm. diametro; frondibus solitariis vel 2–5, 1–2.5 **dm. altis**; **lamina** sessili vel basi brevi angustato sicut petiolo ornata plerumque 3–6 cm. longa flavido-viridi rhombeo-ovata apice late obtusa vel abrupte acuta basi abrupte angustata vel truncata; venis basalaribus 5–7, mediana apicem attingente, lateralibus divergentibus prope basin ramosis et mox inter areolas evanescentibus; latere utroque costae seriebus duobus areolarum magnarum duplo vel triplo longiorum quam latarum, hinc areolis versus marginem gradatim decrescentibus; venulis inclusis paucis; sporophyllo plerumque quam stipite breviore, spica 1–4 cm. longa apiculata; sporangiis globosis c. 1 mm. diametro maturis flavis, 7–30 jugis; sporis foveolatis.—Prope Gainesville, Florida, April 19, 1935, *E. P. & R. P. St. John*, typus in herb. Hort. Bot. Noveboracensis.

ditch 8 miles south of Gainesville, Florida, April 19, 1935, *E. P. & R. P. St. John*, TYPE in herb. New York Botanical Garden; isotype in herb. E. P. St. John.—Widely distributed in central Florida over an area 150 miles long, at elevations of 20–150 ft. Grows in sand, clay, or muck, commonly among grasses, where the soil is usually damp but not subject to long-continued flooding.

Two forms which differ so much from the type as to be confusing, but which are connected with it by intermediate plants, have been found. For convenience of designation they have been given descriptive names.

Forma **favosum**, n. f. Stouter than the usual form, the common stalk sometimes over 2 mm. in diameter; leaf 6–10 cm. tall; foliage-blade symmetrical, broadly deltoid-ovate, often apiculate or nearly so, broadly cuneate or subcordate at the base; basal veins usually 3; areolae more regularly hexagonal than in the typical form and much more uniform in size; included veins frequent, often nearly subdividing the larger areolae; spores maturing in May; sporophylls not found November–February.[3] (Fig. 2.) Roadside ditch 8 miles south of Gainesville, Florida, occupying a few square yards at one end of a colony of the species, May 8, 1935, *E. P. St. John*, TYPE in herb. New York Botanical Garden; isotype in herb. E. P. St. John. Abundant in one small area and occasional at several other stations.

Forma **reticulosum**, n. f. A slender plant, 12–20 cm. tall; common stalk sometimes less than 1 mm. in diameter; foliage-blade deep green, ovate-lanceolate, blunt or rounded at the tip, gradually narrowed or cuneate at the base, usually curved to one side; basal veins usually 7, the adjacent veins parallel with the mid-vein for a short distance; areolae much smaller and narrower than

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[3] OPHIOGLOSSUM FLORIDANUM, forma **favosum**, f. nov., quam forma typica validius 6–10 cm. altum, stipite ad 2 mm. ultra diametro; lamina late deltoideo-ovata symmetrica apice saepe apiculata basi truncata vel subcordata; venis basalaribus plerumque 3; areolis constantius hexagonis quam in forma typica et minus inaequalibus, venulis inclusis numerosioribus.—Prope Gainesville, Florida, May 8, 1935, *E. P. St. John* typus in herb. Hort. Bot. Noveboracensis.

in the typical form; spores apparently maturing in late summer, sparingly as late as December.[4] (Fig. 3.) In an abandoned clay-pit near Weed's Landing bridge, east of Floral City, Florida, Jan. 15, 1936, *E. P. St. John,* TYPE in herb. New York Botanical Garden; isotype in herb. E. P. St. John. Occasional at the more southern stations for the species and perhaps occupying damper soil than the typical form.

Grateful acknowledgement is made to Dr. John K. Small of the New York Botanical Garden for the drawings used herewith, for assistance in preparing the technical descriptions, and for encouragement and aid without which the studies in which the writer is engaged would hardly have been undertaken.

FLORAL CITY, FLORIDA.

Some Impressions of the "Land of Ferns," and a Florida Fern Garden

MAURICE BROUN

Florida is the land of promise for the fern student. With great expectations he will journey into the southern part of the State to make new fern acquaintances. But he is certain to meet with bewilderment and disappointment in proportion to his hopes. The fern glories of this region, of which we have all read, are fading all too quickly. One of the first things I saw soon after my arrival was the complete annihilation, near Fort Lauderdale, of a magnificent cypress swamp in which there had flourished such a variety of orchids and ferns as to delight even the most blasé of students.

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[4] OPHIOGLOSSUM FLORIDANUM, f. **reticulosum,** f. nov., gracile 12–20 cm. altum; lamina saturate viridi ovato-lanceolata apice obtusa vel rotundata basi gradatim angustata vel cuneata plerumque asymmetrica; venis basalaribus plerumque 7; areolis valde minoribus angustioribusque quam in forma typica.—Prope Floral City, Florida, Jan. 15, 1936, *E. P. St. John,* typus in herb. Hort. Bot. Novebor.

You may find some 35 kinds of ferns within a radius of 30 miles of Miami. Not so long ago this region could boast of a greater number of ferns, among them *Meniscium reticulatum, Cheiroglossa palmata, Dennstaedtia adiantoides* and others, but the everlasting fires have exterminated them. Just try to find these interesting ferns anywhere in southern Florida! And gone like the snows of yesteryear are the luxuriant hammocks in which A. A. Eaton discovered so many new and interesting ferns thirty years ago. During the past decade *Homo sapiens* has written "progress" over the face of the land. The ecological conditions of Eaton's time are hard to find; instead there is intensive cultivation of the land; wide-spread fires that are forever devouring hammock and pineland; drainage ditches and roads and land developments. Nor has "progress" alone determined the fate of so many of Florida's floral treasures: commercial orchid-hunters and fern-dealers have helped materially to alter the picture.

Within the city limits of Miami, however, are hammocks which have escaped destruction, and much of their original character has been preserved. These are known as the Matheson Estate and the Brickell Hammock, extremely interesting reminders of the past. But even these sanctuaries harbor a very limited number of the native ferns.

There are at least two persons in Miami that manifest a deep and active interest in the ferns. These devotees are Mrs. E. Peterson of North Miami, and Mrs. Mary Lott of 1718 S. W. 23d Street. The botanical itinerary of all northern fern students travelling in lower Florida should include a visit to the ferneries of these ladies. There is a real treat in store for such travellers. With consummate skill and patience these ladies have developed fern gardens *par excellence*, using nothing but local material.

As I am more familiar with Mrs. Peterson's ferneries, and their contents, I would like to put hers on record. They comprise three units: the patio, about fifteen feet square, contains 38 species of ferns; a rock garden, which is probably three times as large as the patio, has 34 species; and a slat-house, fifteen feet by twelve, shelters 33 kinds. Altogether 56 species of ferns are represented, or 64 per cent of the species listed in Dr. Small's "Ferns of Florida," exclusive of fern allies. Mrs. Peterson's gardens harbor very few of the ferns found in the northern part of the State; her collection is typical of the peninsular fern flora, and in that respect it is nearly complete. Here, then, as may be seen by a glance at the list, is a gathering of truly tropical American ferns.

Most of these ferns Mrs. Peterson has collected herself. They have taken kindly, for the most part, to their new homes. *Dryopteris gongylodes* was an erstwhile tyrant, running roughshod over everything else, so that finally Mrs. Peterson was obliged to root it out altogether; hence it does not appear in the list.

The removal of the shallow surface soil and sand from the soft, oölitic limestone which prevails in this region, reveals a beautiful formation of pitted, cavernous rock. These pits, which Mrs. Peterson has uncovered, are excellent duplicates of those found in the lime-sink hammocks, and they lend themselves admirably to her scheme of naturalistic planting. In these pits thrive her Trichomanes, the Tectarias, and the dainty Aspleniums.

The little patio contains by far the choicest part of Mrs. Peterson's treasures. And in it you will see the lowliest to the tallest—the minute filmy ferns enveloping a rock which originated in a hammock thirty miles to the south, to the six foot fronds of the stately leather-fern, *Acrostichum daneaefolium*. *Trichomanes lineolatum* has found its new habitat so congenial that it has spread of

its own accord to surrounding rocks. The giant bracken, *Litobrochia tripartita*, and the graceful fronds of *Dryopteris ampla* (virtually a tree fern) command your attention. Magnificent specimens, all, you think, and then as you become lost in thought your vision rests on the fresh, delicate greenery of a bed of maidenhair, *Adiantum tenerum*. Presently you are peering down into one of those intriguing pits, and you find a fascinating variety of the smaller ferns, the loveliest being the finely-cut, iridescent *Asplenium verecundum*, and the rare, lustrous-leaved holly-fern, *Stenochlaena Kunzeana*. The prize pit of them all, however, is that which houses all four of the Tectarias found in Florida. This is a most successful little group. Incidentally, *Tectaria Amesiana* and *Tectaria coriandrifolia* deserve the blue ribbon as being among the most precious of the ferns in the entire collection.

From the patio you wander to the rock garden, with its little pools. Here the Dryopteris group is best represented. Mrs. Peterson has all the Florida shield ferns, with the exception of *D. hexagonoptera*, which grows in the northern part of the State, and the previously mentioned *D. gongylodes*. The most distinguished fern in the gathering is *Dryopteris submarginalis*. No escape from cultivation is this tropical species, for in April, 1934, Mrs. Peterson and others found it growing in Royal Palm Hammock, an unscathed wilderness as yet in the Big Cypress Swamp of Collier County. This fern is not described in Dr. Small's book.

The little slat-house has a fine assortment of ferns, most of which are potted. Here you meet again *Dryopteris submarginalis*, together with *Lycopodium dichotomum*, a species of lycopod new to Florida, discovered by Mrs. Peterson and Mr. Charles Mosier in the same locality in which *D. submarginalis* came to light. The two species

of ferns of greatest interest here, perhaps, are the strap-ferns, *Campyloneuron angustifolium* and *C. costatum*, both extremely rare in the region. The former had a timely rescue from Timm's Hammock, near Homestead. Once one of the finest hammocks in southern Florida, Timm's is now honeycombed by paths, littered with debris, and, in brief, stripped of all its former glory. *Campyloneuron costatum* also came from the exceptionally productive Royal Palm Hammock.

I append the list of Mrs. Peterson's ferns, with the wish that some day the reader may have the fortune to meet this gracious lady, and experience the delights that I did in her charming gardens:

Botrychium obliquum
Trichomanes lineolatum
" *Kraussii*
Osmunda regalis
" ***cinnamomea***
Anemia adiantifolia
Stenochlaena Kunzeana
Acrostichum daneaefolium
Polypodium Plumula
" *pectinatum*
" *polypodioides*
Phlebodium aureum
Asplenium serratum
" *heterochroum*
" ***abscissum***
" *dentatum*
" ***verecundum***
" ***biscayneanum***
" ***pumilum***
" ***Curtissii***
" ***cristatum***
Tectaria heracleifolia
" ***minima***
" *Ameslana*
Campyloneuron angustifolium
" *Phyllitidis*
" ***costatum***
Phymatodes heterophyllum
Vittaria lineata
Pycnodoria pinetorum
" ***vittata***
" ***cretica***
Pteris caudata
Litobrochia tripartita
Adiantum Capillus-Veneris
" *tenerum*
Hypolepis repens
Cheilanthes microphylla
Blechnum serrulatum
" *occidentale*
Tectaria coriandrifolia
Dryopteris ampla
" ***setigera***
" *panamensis*
" ***normalis***
" ***patens***
" ***augescens***
" ***Thelypteris***
" ***floridana***
" *submarginalis*
" ***dentata***
" *subtetragona*
" *reptans*
Nephrolepis exaltata
" ***biserrata***
Sphenomeris clavata

ORLEANS, CAPE COD, MASS.

A List of Varieties and Forms of the Ferns of Eastern North America

C. A. WEATHERBY

(*Continued from p. 16*)

DRYOPTERIS. For several years I have used the name *Thelypteris* for this genus on grounds of priority. At the Botanical Congress of 1935, however, *Dryopteris* was proposed for conservation against *Thelypteris* and, although final action has not yet been taken, in all probability it will be conserved. I am accordingly taking it up here. Alternative names under *Thelypteris* are given where they exist, but no new combinations are made under it.

DRYOPTERIS FILIX-MAS (Linnaeus) Schott, Genera Filicum, under plate 9 (1834). *Polypodium F.-m.* Linnaeus, Species Plantarum 1090 (1753). *Thelypteris F.-m.* Nieuwland, American Midland Naturalist **1**: 226 (1910). —Pinnules with nearly parallel sides, finely toothed, especially at the broad, blunt apex.

From Linnaeus's description, this appears to be the typical form and is so treated by most European authors. Druery, however, (British Ferns and Their Varieties 148 (1910)) who, following Wollaston, divides the species into three, calls this "*Lastrea pseudo-mas* Wollaston." He states that its leaves are more nearly evergreen than in either of the other two "species."

F. *incisa* (Moore) Hayek, Flora von Steiermark **1**: 35 (1908). *Lastrea Filix-mas* var. *i.* Moore, Phytologist **3**: 137 (1848).—Pinnules tapering more or less to the rounded or even somewhat acute tip, evenly and rather coarsely toothed throughout. *Lastrea Filix-mas* of Druery.

Other European forms, such as f. *subintegra* (Doell) Hayek, in which the pinnules, otherwise as in the typical

form, are toothed only at the apex, and f. *deorso-lobata* (Moore) Hayek, in which the deeply and sometimes doubly serrate pinnules have a projecting basal lobe on the side next the main rachis, may very likely be found in America.

Dryopteris marginalis (Linnaeus) A. Gray, Manual 632 (1848). *Polypodium m.* Linnaeus, Species Plantarum 1091 (1753). *Thelypteris m.* Nieuwland, *op. cit.* 226.—Blades pinnate-pinnatifid or bipinnate; pinnules oblong, broadly obtuse, entire or wavy-margined, or a few of the lower obtusely toothed; lowest pinnae lanceolate, the basal pinnule on the lower side little, if any, longer than the middle ones, or even shorter.

F. **tripinnatifida** (Clute), n. comb. *Nephrodium marginale* f. *t.* Clute, Fern Bulletin **15**: 21 (1907); **19**: 50 (1911).—Pinnules deeply toothed, more narrowly obtuse or acutish.[1]

F. elegans (Robinson) F. W. Gray, American Fern Journal **14**: 9 (1924). *Aspidium marginale* var. *e.* Robinson, Bulletin Essex Institute [Salem, Mass.] **8**: no. 3, 51 (1875). *Thelypteris marginalis* f. *e.* Weatherby, Proceedings Boston Society Natural History **36**: 197 (1922).—Like the preceding, but the lowest pinnae more or less triangular, the basal pinnules on the lower side longer than the middle ones. A luxuriant state.

Lastrea marginalis β *Traillae* Lawson, Edinburgh New Philosophical Journal **19**: 275 (reprint 19) (1864), appears to be the same, though Clute (Fern Bulletin **19**: 51) keeps it distinct on the ground that the lobes of the pinnules are longer and more oblong. Though Lawson's

[1] The name of this form has suffered much indignity at the hands of printers or careless writers. It originally appeared, without description, as *tripinnatifidum*, and since this expresses the character of the plant concerned and was apparently intended, I have retained it. But in Fern Bulletin **19**: 50, where the form was first defined and illustrated, the name appears as *bipinnatifidum* and in the index to the last ten volumes of the Bulletin it is reduced to *pinnatifidum!*

name is the older, *elegans* was the first to be used in the category of forma. I have kept Clute's application of it, though there is little in Robinson's description to show just what phase he actually had.

F. **Davenportii** (Floyd) A. R. Prince ms., n. comb. *Nephrodium marginale* f. *D.* Floyd, Rhodora **4**: 245 (1902). *Thelypteris marginalis* f. *D.* L. B. Smith, Rhodora **30**: 17 (1928).—Like the typical form, but the tips of the blade and pinnae crested.

F. CHURCHIAE (Gilbert) Leeds, American Fern Journal **23**: 12 (1933). *Polypodium vulgare* var. *C.* Gilbert, Fern Bulletin **14**: 39 (1906).—Dwarf, the pinnae entire or irregularly lobed, the tip of the blade heavily crested.

A peculiar stunted form, about the size of the polypody and mistaken for it by Gilbert and others until Mr. Leeds pointed out its true affinity. It has not been known to produce fruit, but the rootstock, the texture and anatomy of the frond and the type of scales all bear out his conclusion that it belongs here.

Nephrodium marginale, "form" *distans* Waters, Ferns 238 (1903), is described as having more or less pinnatifid pinnules separated by spaces about their own width. This spacing seems to be the more usual condition in all fully bipinnate fronds; it does not correlate with degree of cutting and offers an insecure basis for formal segregation.

DRYOPTERIS FRAGRANS (Linnaeus) Schott, Genera Filicum under plate 9 (1834). *Polypodium f.* Linnaeus, Species Plantarum 1089 (1753). *Thelypteris f.* Nieuwland, American Midland Naturalist **1**: 226 (1910).—Blades narrowly lanceolate, pinnae and pinnules usually crowded together, rachis beneath thickly beset with large, reddish-brown scales.—Greenland and Labrador to Alaska and Siberia.

Var. **Hookeriana** (Fernald) A. R. Prince ms., n. comb. *Thelypteris fragrans* var. *H.* Fernald, Rhodora **25**: 3 (1923).—Blades lanceolate, pinnae and pinnules

usually not crowded, rachis beneath with comparatively few and small scales.—Newfoundland to New England, New York and Minnesota; temperate eastern Asia. Perhaps no more than a response to favorable conditions of growth.

Dryopteris Goldiana (Hooker) A. Gray, Manual 631 (1848). *Aspidium G.* Hooker ex Goldie, Edinburgh Philosophical Journal **6**: 333 (1822). *Thelypteris G.* Nieuwland, *op. cit.* 226.

Lawson (Edinburgh New Philosophical Journal **19**: 276 (reprint 20) (1864)) distinguished two "sub-varieties" of *Lastrea Goldiana,* as he called it: *serrata,* with coarsely toothed ultimate divisions, and *integerrima,* with them almost or quite entire. Although in other species I am accepting forms based on just this character, in this case I cannot make them out. The extremes are so close and intermediates so much more numerous that any attempt at separation seems futile.

Much more puzzling is *D. Goldiana* subsp. *celsa* William Palmer, Proceedings Biological Society Washington **13**: 65, plate 1 (1899). This is a plant of the Dismal Swamp, never yet quite matched elsewhere. It has lanceolate or lance-ovate blades with conspicuously stalked pinnae which taper gradually to an acute tip and are deeply pinnatifid or fully pinnate in their lower portions and with sori close to the midrib. L. M. Underwood referred it to *D. Clintoniana;* Dowell to *D. Clintoniana* × *Goldiana.* It resembles either of these more than it does typical *D. Goldiana;* Dowell's guess is perhaps the best so far, though when he made it, neither of the supposed parents were known within a hundred miles of the Dismal Swamp. *D. Goldiana,* however, has since been discovered near by; and *D. cristata* var. *Clintoniana* may yet be.

D. Goldiana var. *prolifera* Gilbert, Fern Bulletin **8**: 9 (1900), described as having some pinnae which end in a large pinnule or a pair of them, at the base of which

is a bud (or buds) from which spring little rosettes of pinnules, has, so far as I know, never been seen again. Its description suggests the effect of injury; until it is rediscovered, Gilbert's "variety" had best be kept in abeyance.

DRYOPTERIS CRISTATA (Linnaeus) A. Gray, Manual 631 (1848). *Polypodium c.* Linnaeus, Species Plantarum 1090 (1753). *Thelypteris c.* Nieuwland, op. cit. 226.—Fertile fronds longer than the sterile, the blade narrowly lanceolate, growing stiffly upright, the pinnae often horizontal, with their planes set at right angles to the direction of the rachis, the lowermost shorter, triangular.

Few pteridologists have found any noteworthy variants in this species, except the well-known var. *Clintoniana,* often regarded as a species. Tidestrom, however, in Elysium Marianum 44, plate VI (1906), recognizes three forms—the typical, in which the pinnae are lanceolate to triangular, acute and deeply pinnatifid, the lobes divided nearly to the midrib; "*Dryopteris cristata mariana,*" in which they are ovate-oblong, obtuse and cut only part way to the midrib; and "*D. cristata lancastriensis,*" based on *Aspidium lancastriense* Sprengel, Anleitung zur Kenntniss der Gewächse **3**: 134 (1804), in which the pinnae are narrowly oblong-lanceolate, very acute and rather shallowly lobed.

As described, these forms sound well enough; but I find it impossible clearly to distinguish them in a large series of specimens. The second ("mariana") is rather commonly found in reduced sterile fronds and may reasonably be regarded as a juvenile or poorly developed state. Whether the third is really *Aspidium lancastriense* of Sprengel may be doubted; the original description is not sufficiently detailed to indicate clearly what Sprengel had before him. This form, however, has been accepted by Clute (Check-list of North American Fern-

worts in Fern Bulletin **15**: 20 (1907)) and by Gilbert (List of North American Pteridophytes **17**: (1901)).

What *Nephrodium cristatum marginale* of Gilbert's List (p. 17) and of Clute's Check-list (Fern Bulletin **15**: 20) may be, or on what it is based, I do not know—unless it is a blunder for the hybrid *N. cristatum* × *marginale*, first described by Davenport.

Var. CLINTONIANA (D. C. Eaton) Underwood, Our Native Ferns, ed. 4, 115 (1893) *Aspidium cristatum* var. *C.* D. C. Eaton in Gray, Manual, ed. 6, 688 (1890). *Thelypteris cristata* var. *C.* Weatherby, Rhodora **21**: 177 (1919).—Blades broadly lanceolate, the fertile and sterile alike; pinnae in the same plane as the rachis, the lowermost little reduced, ovate- or triangular-lanceolate; lobes of the pinnae only finely toothed.

F. **Slossonae** (Davenport), n. comb. *Nephrodium cristatum* var. *S.* Davenport, Rhodora **4**: 52 (1902).—Lobes of the pinnae coarsely toothed. Said not to be evergreen.

Nephrodium cristatum Clintonianum f. *sylvaticum* Poyser, Fern Bulletin **16**: 12 (1908), does not belong here at all but, according to Benedict, is the hybrid *D. Goldiana* × *spinulosa.*

DRYOPTERIS SPINULOSA. The following key, adapted from Prof. Fernald's in Rhodora **28**: 146 (1930), may serve to distinguish the five varieties recognized under this species. Since their characteristic leaf-forms are far easier to see than to describe and since I am more often asked for help in identifying specimens of this group than of any other of the shield-ferns, I have, with the generous assistance of my wife, supplemented the descriptions with drawings of typical basal pinnae.

a. Basal pinnules on the upper and lower sides of the lowermost pinnae nearly opposite, rarely more than 4 mm. (1/6 in.) apart. *b.*

b. Blade often only bipinnate, glabrous, as are the indusia; pinnae tending to be set obliquely to the main rachis

and to taper rather evenly to an acute point; pinnules of the middle pinnae often only toothed, the basal pinnule on the lower side of the lowermost pinnae longer than the one next it. ..... *D. spinulosa* (fig. 1).

b. Blade bipinnate-pinnatifid, more or less glandular beneath, especially on the midribs of the pinnae near their base; indusia glandular; pinnules of the middle pinnae deeply pinnatifid, the basal pinnule on the lower side of the lowermost pinnae not longer than the one next it. ..... *c.*

c. Pinnae tending to be set at right angles to the main rachis and to taper rather abruptly to a long, narrow point. Var. *intermedia* (fig. 2).

c. Shape and position of pinnae as in typical *D. spinulosa*. Var. *fructuosa* (fig. 3).

a. Basal pinnules on the upper and lower sides of the lowermost pinnae 0.5 to 2 cm. (¼ to nearly an inch) apart, that on the lower side farthest from the main rachis and commonly exceeding the one next it. ..... *d.*

d. Blade ovate to ovate-triangular, bipinnate-pinnatifid, glabrous; segments of the lower pinnules of the lowermost pinnae oblong, with broad bases; indusia usually glabrous, rarely with a few marginal glands. Var. *americana* (fig. 4).

d. Blade lanceolate, tripinnate, more or less glandular; segments of the lower pinnules of the lowermost pinnae elliptic-lanceolate or somewhat diamond-shaped, with narrow, sometimes stalk-like bases; indusia glandular on the back. Var. *concordiana* (fig. 5).

Bibliography and ranges of these varieties are as follows.

DRYOPTERIS SPINULOSA (O. F. Mueller) Kuntze, Revisio Genera Plantarum **2**: 813 (1891). *Polypodium s.* O. F. Mueller, Flora Fridrichsdalina 190, fig. 2 (1767). *Thelypteris s.* Nieuwland, American Midland Naturalist **1**: 226 (1910).—Labrador to Montana, south to "Virginia," Indiana and Iowa. Also in Eurasia.

Var. INTERMEDIA (Muhlenberg) Underwood, Our Native Ferns, ed. 4, 116 (1893). *Polypodium intermedium* Muhlenberg ex Willdenow, Species Plantarum **5**: 262 (1810). *Thelypteris spinulosa*, var. *i.* Nieuwland, *op. cit.* **2**: 278 (1912).—Newfoundland to the mountains of North Carolina and Tennessee, west to Ontario, Wisconsin and Illinois. Not in Eurasia.

Var. FRUCTUOSA (Gilbert) Trudell, American Fern Journal **20**: 39 (1930). *Nephrodium spinulosum fructuosum* Gilbert, List North American Pteridophytes 37

Fig. 1. Dryopteris spinulosa; Fig. 2, var. intermedia; Fig. 3, var. fructuosa; Fig. 4, var. americana; Fig. 5, var. concordiana.

(1901). *Thelypteris spinulosa* var. *f*. Fernald, Rhodora **28**: 146 (1926).—Range nearly that of var. *intermedia*, though apparently not extending so far south.

This falls between typical *D. spinulosa* and var. *intermedia*, having much the aspect of the former, but the glandularity and usually the short basal pinnules of the latter. It might conceivably have arisen from crossing between the two; if so, it has become very thoroughly established, for it is widely distributed and not at all rare.

Var. AMERICANA (Fischer) Fernald, Rhodora **17**: 48 (1915). *Aspidium spinulosum americanum* Fischer ex Kunze, American Journal Science, series 2, **6**: 84 (1848). *Thelypteris spinulosa* var. *a*. Weatherby, Rhodora **21**: 178 (1919).—Greenland to the mountains of North Carolina and Tennessee and northward across the continent to Oregon and British Columbia.

Var. CONCORDIANA (Davenport) Eastman, New England Ferns 20 (1904). *Nephrodium spinulosum* var. *c*. Davenport, Rhodora **6**: 33 (1904). *Thelypteris spinulosa*, var. *c*. Weatherby, l. c.

This is a curious and anomalous plant, combining the texture and glandularity of var. *intermedia* with the leaf-architecture of var. *americana* and a semi-skeletonized degree of dissection and a development of narrow-based pinnules all its own. It can hardly be interpreted as a cross between the two varieties; that cross, which occasionally is found in northern woods, is of very different aspect, less finely dissected than var. *intermedia* and quite lacking the narrow-based pinnules of var. *concordiana*. The latter may reasonably be interpreted as a derivative of var. *intermedia*, some individuals of which show a tendency to narrow-based pinnules in the lower pinnae. Generalization, however, is dangerous, since var. *concordiana* is still certainly known only from the original collection at Concord, Mass., though I have recently seen similar material from Pennsylvania.

Many botanists treat the above as three species, *D. spinulosa*, *D. intermedia* (Muhlenberg) A. Gray and *D. dilatata* (Hoffmann) A. Gray. If this is done, var. *fructuosa* becomes a variety of *D. intermedia* and var. *americana* one of *D. dilatata* (*D. d.* var. *a.* (Fischer) Benedict) or even a distinct species, *D. campyloptera* (Kunze) Clarkson. Var. *concordiana* might be placed either with *D. intermedia* or *D. dilatata*, according to which of its characters one considers of greatest importance.

Certain other names have been applied to American ferns of this group. Such are "*Dryopteris spinulosa-remota*" (Watt), *D. spinulosa*, var. *dumetorum* (Underwood), and *Lastrea dilatata* β *tanacetifolia* (Lawson). The first is based on *Aspidium remotum* A. Br., now generally regarded as the hybrid *D. Filix-mas* × *spinulosa*. Watt applied the name incorrectly to × *D. Boottii;* the *remota* hybrid, however, might occur in eastern North America, though it has not yet been detected here. The other names were originally proposed for European forms of typical *D. dilatata* which is not known to occur here; it is hardly possible that they can be correctly applied to any of our plants.

Aspidium spinulosum var. *dilatatum* f. *anadenium* B. L. Robinson, Rhodora **9**: 84 (1907), is the same as var. *americana*.

GRAY HERBARIUM

(To be continued)

Recent Fern Literature

Mr. B. F. Bush has reprinted the list of ferns given in Tracy's Catalogue of the Plants of Missouri (1886), with notes in which ranges are revised in the light of recent knowledge and an attempt is made to fix the identification of species listed under old and now dubious

names and correct errors of determination. Even in 1886, 43 species were known from the state.[1]

There is considerable floristic activity in Tennessee at present and a fair share of it is directed at the ferns. As one step in the working out of a detailed record of their distribution in the state, Mr. J. R. Endsley has published a careful study of the species occurring in Chester County. There are only 14 of them—not too bad in an area which has no rock outcrops and much country otherwise unsuited for ferns. The habitat and local distribution of each of the fourteen are recorded in obviously well studied detail.[2]

Dr. Ching separates as a genus a group of compound-leaved species previously placed in *Polystichum* or *Dryopteris* which agree in certain features of leaf-architecture and in having running rootstocks with fronds placed singly and far apart. *Polystichum adiantiforme* and *P. aristatum* are the best-known members of the group. The name *Rumohra* Raddi, founded on a form of *P. adiantiforme*, is chosen for the new genus, which contains 30 Oriental species and probably as many more in the New World.[3]

In the course of a series of popular articles on wild flowers of Louisiana, Prof. Brown has produced a well-developed fern flora of the state. A general introduction is followed by lists of species which grow in different habitats, notes on cultivation and morphological terms, a key to the genera, and descriptive notes on each

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1 Bush, B. F. Tracy's Ferns of Missouri. Amer. Midl. Nat. 16: 626–628 (1935).

2 Endsley, J. R. A preliminary report on the ferns of Chester County, Tennessee. Journ. Tenn. Acad. Sci. 106–110, 3 figs. (1935).

3 Ching, R. C. A revision of the compound-leaved Polysticha and other related species in the continental Asia, including Japan and Formosa. Sinensia 5: 23–91, 18 pls., 2 figs. (1935).

of the 45 species known in the state. There are 19 illustrations from photographs and drawings.

There are slips here and there. "Rootstalks" should be "rootstocks"; Prantl, not Mettenius, described *Ophioglossum Engelmanni;* and the statement that *Pycnodoria* (better known as *Pteris*) *vittata* closely resembles *Pteris* (better known as *Pteridium*) *latiuscula* is an extraordinarily careless one. The two differ radically and very obviously in nearly every character. The key suffers at times from over-simplification; surely more useful points of distinction between *Polypodium polypodioides* and *Dryopteris hexagonoptera* than "Plants epiphytic" and "Plants terrestrial" could have been found. But the matter of the article is on the whole sound and clearly set forth and, with its ten additional species, it brings the old fern flora of Clute and Cocks (1903) very acceptably up to date.[4]

Shorter Notes

A FERN SURPRISE.—On a February afternoon in 1935 when the mercury hovered around eighty degrees (ground hog day, to be exact), we started for a drive to explore some of the nearby canyons and foothills, not knowing just where we were going. Our course was soon decided by the front seat, so out through Laurel Canyon we went, onto Ventura Boulevard toward Calabasas. Going up a little hill and around another curve, we greet with exclamations of delight several open hills ablaze with California Golden Poppies. Then we see on the left a very inviting road turning back into the beautiful Malibu Hills. We drive in and out along the winding road, past green fields, pastures of contented

[4] Brown, Clair A. Some wild flowers of Louisiana, part V. Ferns and fern allies. Louisiana Conservation Review 5: 12–23, 19 figs. Jan. 1936.

cows, many farmhouses each with its yellow acacia tree in full bloom, now along a beautiful creek and through a camp where a moving picture company is taking pictures. A beautiful hillside, where *Thelypteris arguta* is growing in one solid mass, comes into view; and on farther into the hills the white blossoms of the *Ceanothus* with the green of the other trees make a picture to be remembered.

We now follow another stream, deep down in the canyon, which we decide we will investigate if our road goes near it. Finally we cross it where there is a check dam on one side and a culvert underneath the road. We park our car and the male of the family scrambles down to the stream, returning with cups of good, cold water for each of us. After exploring a little, we find, to our amazement, that one could stand in the road with a few small stones and throw one to the right, reaching *Polypodium californicum* growing in the crevice of a rock, another stone would reach just beyond on a steep bank of rich leaf mold, *Thelypteris arguta* and *Adiantum Jordani*, a strange combination! Straight ahead, as the road veers off a bit, our stone lodges in some yellowish soft rock amid *Cheilanthes californica*, our most delicate fern; to the left, a little longer throw on a hillside of rich dark earth among rocks reveals *Pellaea andromedaefolia*, *Pellaea mucronata* and *Selaginella Bigelovii*.

Do you wonder that we call it a "fern surprise" to find seven ferns and one of the fern allies, so different in habitat and range, growing happily so near each other?—MAY N. ACKLEY, *Los Angeles, Cal.*

PELLAEA GLABELLA IN THE NIAGARA FRONTIER REGION.—According to the "Annotated List of the Ferns and Flowering Plants of New York State" by Dr. Homer D. House, published in 1924, *Pellaea glabella* Mett. is not known for New York state. In a recent communica-

tion to me, however, Dr. House assures me that he has records of this fern, as yet unpublished, from a number of counties in the state. These include Madison, Tioga, Columbus, Albany, and Niagara counties. Another locality record of interest is beautiful Niagara Glen, in Ontario, Canada.

During the summer of 1935, I was searching the latter-mentioned place for three rare species of ferns, reported from that place by some early botanists, namely the hart's tongue, the well-rue spleenwort, and the slender cliff brake. Unfortunately, I was unable to find any of these ferns but I did notice a fine display of what I took to be the purple-stemmed cliff brake. Several weeks later, Dr. Wherry of the University of Pennsylvania pointed out to me the difference between *Pellaea atropurpurea* and *Pellaea glabella*, and proved to my satisfaction that I had collected the latter rather than the former.

This led to a perusal of an article on the validity of this species* and comparison with my herbarium specimens. There seems to be a difference of opinion as to the validity of the species *glabella* but a great many botanists are swinging to the belief that it is a good species. A side by side comparison of the two species, using Fermen L. Pickett's article as a guide, shows a number of clear-cut distinctions. It might not be amiss to mention a few of these. *Pellaea glabella* has a smooth stem in contrast to the rough stem or stipe of *atropurpurea*, it is a more compact plant, has the lowest pinnae subsessile and rarely more than three-lobed, and red-brown scales in life and in death, the latter character in contrast to the white scales of *atropurpurea* which turn brown in age.

* Is Pellaea glabella a distinct species?—Fermen L. Pickett. American Fern Journal 7: No. 1, January–March, 1917.

In pursuing the subject further, I discovered that there are only three sheets of *Pellaea* in the Buffalo Museum of Science herbarium that were collected locally and all three of them, labeled *P. atropurpurea*, are *P. glabella*. Two were collected before the species was recognized. Mr. Charles Zenkert collected *P. glabella* from crevices in the gigantic limestone cliffs at the whirlpool, Niagara Falls, N. Y., but it was not recognized as such until after the publication of his "Flora of the Niagara Frontier Region." Although I have yet to see a sheet of *P. atropurpurea* from this region, I have no doubt that there may be some in existence. I do believe, however, that *P. glabella* will prove to be the commoner species with us here in the Niagara frontier region.—IRVING W. KNOBLOCH, *Allegany State Park, Red House, N. Y.*

A CATALOG OF HARDY FERNS.—It may be that some of the readers of the FERN JOURNAL are familiar with the catalogs of hardy plants of the Perry establishment of England. The Perry name is known for a variety of flowering plant genera, particularly *Hemerocallis*. There has recently been received the Perry list of hardy ferns, a twelve-page leaflet illustrated with half-tones and sketches, and listing several hundred species and varieties. It is interesting in this list to see a good representation of native American species, together with typical forms of various European and Asiatic species. A considerable number of the forms listed would probably not be hardy in our northern states.

The greater portion of the catalog is devoted to lists of some of the numerous horticultural varieties of common hardy ferns. Of those of *Dryopteris Filix-mas*, 33 varieties and sub-varieties are listed. Of *D. dilatata*, there are 7; of the lady fern, 62. The largest repre-

sentation of varieties is found in *Polystichum angulare*, a species related to our *P. Braunii.* Of the Hart's-tongue, some 50 different types are listed.

It is rather interesting to note that there are few or no varieties in most of the common American species offered in this catalog.

Perry's Hardy Plant Farm is located at Enfield, Middlesex, England.—R.C.B.

American Fern Society

Edward Willis Graves, a member of the Society since 1917, died at Nevada, Iowa, Feb. 1, 1936. He was born Feb. 24, 1882, on a farm near Claremont, Missouri, where his youth was spent. In 1903 he moved to Kansas. In 1906 he married Lillie B. Moyer; she and one son survive him. Three years later he moved again, this time to northern Alabama.

Mr. Graves had always shown a deep interest in nature; he was not slow to seize the opportunity which the comparatively rich Appalachian flora of his new home offered him, especially in ferns. Ever a keen observer, he became an earnest student of the group. He made many discoveries of interest, the most striking a new hybrid in *Asplenium* which was named for him, *A. Gravesii,* by Dr. Maxon. Readers of the JOURNAL will not soon forget the series of articles which was the fruit of his activities during the twelve years of his residence in Alabama, at first in the north, later at Mobile. His work as a collector came to a climax in a journey to Cuba in 1921, during which he secured many specimens of ferns.

Thereafter he returned to the North, settling at Bentonsport, Iowa. The comparatively scanty fern flora of that region limited his activity somewhat; but the dis-

covery of stations for certain Botrychiums, rare thereabouts, turned his attention particularly to that genus, and he entered upon a study of it the results of which appeared in the JOURNAL hardly more than a few days before his death.

Mr. Graves got together a considerable fern herbarium, now in the possession of the writer of this article. It will eventually find its way into several of the great public herbaria. He left another herbarium which contains many ferns.—C.A.W.

On March 2, 1936, Mr. James L. Edwards and I examined the books of the American Fern Society and checked the statement of the financial condition of the Society on December 31, 1935, prepared by the Treasurer. We found that the accounts had been completely and accurately kept and that the statement mentioned was a correct statement of the financial condition of the Society.

HESTER M. RUSK, *Chairman,*
Auditing Committee.

Miss Hester M. Rusk, Brooklyn Botanic Garden, has been appointed Librarian of the Society.

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R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

VOL. 26 JULY–SEPTEMBER, 1936 NO. 3

Variants of Some Appalachian Aspleniums[1]

EDGAR T. WHERRY AND WILLIAM D. GRAY

Ten years ago it was pointed out by the senior author[2] that the "Appalachian Aspleniums" form a series showing intermediates between certain long-recognized species. Two such intermediates were assigned names, *A. stotleri* and *A. trudelli.* In recording the latter in New Jersey, Kobbé and Davis[3] classed it as a form of *A. pinnatifidum,* but Kestner[4] found its spores to be imperfect and non-viable, favoring a hybrid interpretation. It has been regarded, on morphological grounds, as of hybrid origin, by Graves,[5] Blomquist[6] and Small.[7]

A question was raised by Graves[8] as to the distinctness of *Asplenium stotleri* from *A. gravesii,* but after examining photographs of the former he accepted their independence. Kestner[9] raised from spores plants of *A. stotleri* matching in every respect the features of the original colony.

In the present article a series of drawings of these plants and some as yet unreported intermediates and variants are presented. These were made by placing the fronds in an enlarging camera, tracing their outlines on paper, and reducing the drawings again in making the cuts here reproduced. All are natural size, except where otherwise stated.

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[1] Contribution from the Botanical Laboratory and Morris Arboretum of the University of Pennsylvania.

[2] This Journal 15: 47. 1925. [3] *Ibid.* 18: 22. 1928. [4] *Ibid.* 22: 84. 1932. [5] *Ibid.* 16: 48. 1926. [6] Ferns of N. C.: 91. 1934. [7] Ferns of N. Y.: 57. 1935. [8] This Journal 16: 49. 1926. [9] *Ibid.* 22: 83. 1932.

[Volume 26, No. 2 of the JOURNAL, pages 41–76, plates 4–6, was issued July 21, 1936.]

THE PINNATIFIDUM—TRUDELLI—MONTANUM SERIES.

1. A common phase of *Asplenium pinnatifidum* Nuttall, from the McCall's Ferry region, Lancaster County, Pa. The cutting is pinnatifid throughout, even the lowest pair of lobes being adnate to the rachis; lobes obtuse and marginal teeth obscure.
2. A frequent variant, here represented by a frond from Giles Co., Va. Lower lobes set off on short stalks, and margins more distinctly toothed. This may be termed *A. pinnatifidum*, phase approaching *A. trudelli*, or, on the hybrid interpretation, *A. pinnatifidum* > × *montanum*.
3. Typical *A. trudelli* Wherry from its type locality, Cully, Lancaster Co., Pa. Three pairs of lobes have now become pinnae, supported on their individual stalks, and these pinnae are somewhat pinnatifid. This lies so nearly intermediate between the two end-members of the series that an independent name is useful for it, although there seems no doubt that it represents *A. pinnatifidum* × *montanum*.
4. Intermediates between *A. trudelli* and *A. montanum* are apparently rare, but after some years of search a colony of such a plant was located near Ohiopyle, Fayette Co., Pa., from which the frond sketched was obtained. In this the pinna-stalks are so elongated and the toothing so prominent that it might be classed as *A. montanum*, phase approaching *A. trudelli*, or, as a hybrid, *A. pinnatifidum* × < *montanum*.
5. A typical phase of *A. montanum* from Buckingham Co., Va., bipinnate at the base with the pinnules pinnatifid.

In these, as in most of the other drawings, the enlarged pinna showing the venation represents a member of the second pinna-pair.

Appalachian Asplenium—1.

THE PINNATIFIDUM—GRAVESII—BRADLEYI SERIES.

6. *Aspenium pinnatifidum* from the type locality along the Schuylkill River in Philadelphia, Pa. This shows the lobes better developed than No. 1, and in addition the tendency toward areolate veining occasional in this species.
7. This specimen, from York Furnace, York Co., Pa., is similar to No. 2, but shows dark coloration throughout the stipe and dark brown sori. It is therefore regarded as *A. pinnatifidum*, approaching *A. gravesii*, or *A. pinnatifidum* > × *bradleyi*.
8. *A. gravesii* Maxon from McCall's Ferry, Lancaster Co., Pa., ¾ natural size. In outline this resembles some phases of *A. trudelli*, but again the dark stipe and sori indicate a relationship to *A. bradleyi* instead of *montanum*. Being about intermediate between the two end-members of the present series, it may be designated *A. pinnatifidum* × *bradleyi*.
9. Search for a member of the series lying nearer to *A. bradleyi* was long unsuccessful, but one was finally found in a colony discovered many years ago by Dr. Roland M. Harper along Flint River in northwestern Meriwether Co., Ga. This shows a peculiar feature, upward-sloping pinnae—also present on a plant in the U. S. National Herbarium from Hartsville, Darlington Co., S. C.—suggesting a relationship to the subtropical *A. dentatum* (*cf.* fig. 20.) As the latter seems improbable, however, it may be termed simply *A. bradleyi*, phase approaching *A. gravesii*, or *A. pinnatifidum* × < *bradleyi*.
10. A small frond of typical *A. bradleyi* Eaton, from Gaston Co., N. C. The dark coloration extends up the stipe to the fourth pinna-pair, and the margins are much toothed and cut.

Appalachian Aspleniums—2.

PRESUMED PINNATIFIDUM—PLATYNEURON CROSSES

11. *Asplenium pinnatifidum*, a phase with acuminate lobes instead of the obtusish ones of figs. 1 and 6; from York County, Pa., ⅔ natural size. In this case the three presumed hybrids, which follow, do not form a series from one end-member to the other. Apparently, as in the analogous *A. ebenoides* Scott, The parent species are too distantly related; the hybrids combine parental characters in an erratic way, and develop some details of lobing and cutting not shown by either parent.

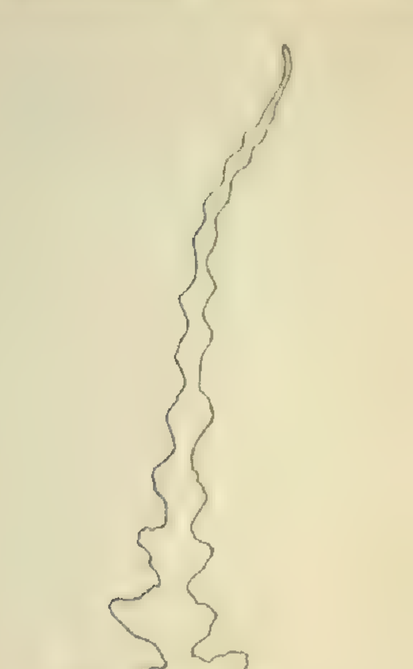
12. This curious plant, here shown about half natural size, was found by Sadie F. Price near Bowling Green, Kentucky, many years ago, and distributed as *A. pinnatifidum*. It may well represent, however, a hybrid with *A. platyneuron*, similar elongate lower divisions being known in *A. ebenoides*.

13. *A. stotleri* Wherry, from the type station in Jefferson Co., W. Va. Although the rounded lobes are anomalous, this is still interpreted, as it was originally, as having developed by hybridization of the two species under consideration.

14. This is a frond on a plant recently collected by Mr. Thomas N. McCoy in Boyd Co., Ky. It appears to represent another result of the same crossing, being intermediate in texture and sorus-color between the two presumed parents. All three of these may be referred to as *A. pinnatifidum* × *platyneuron*; or, if a single name is desired, that first proposed for a hybrid between these two species, *A. stotleri*, may be extended to cover the others, even though their resemblance is but slight.[10]

15. A typical fertile frond of *A. platyneuron* (L.) Oakes, ½ natural size.

[10] This plant is described as a new species on page 104.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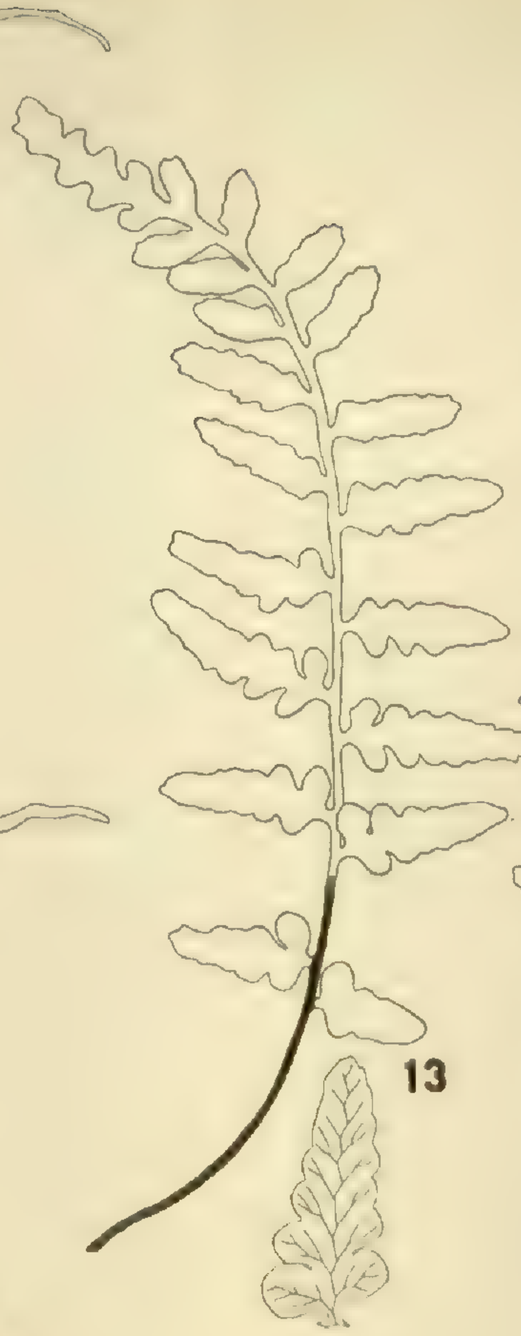
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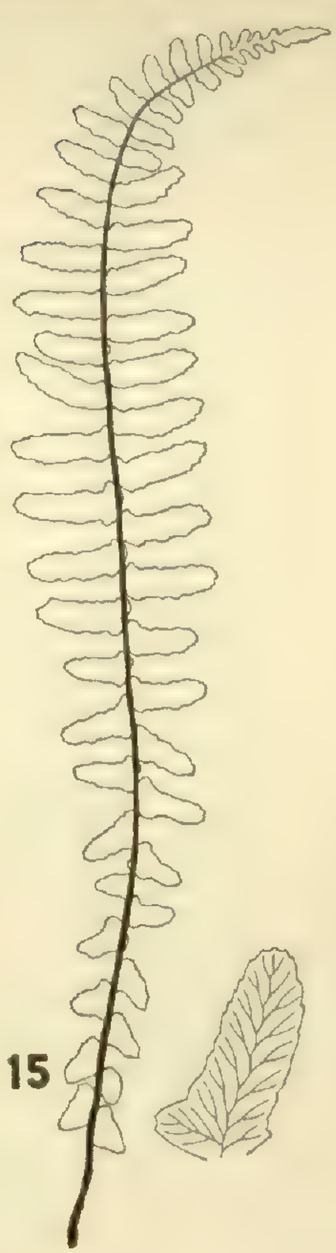

15

Appalachian Asplenium—3.

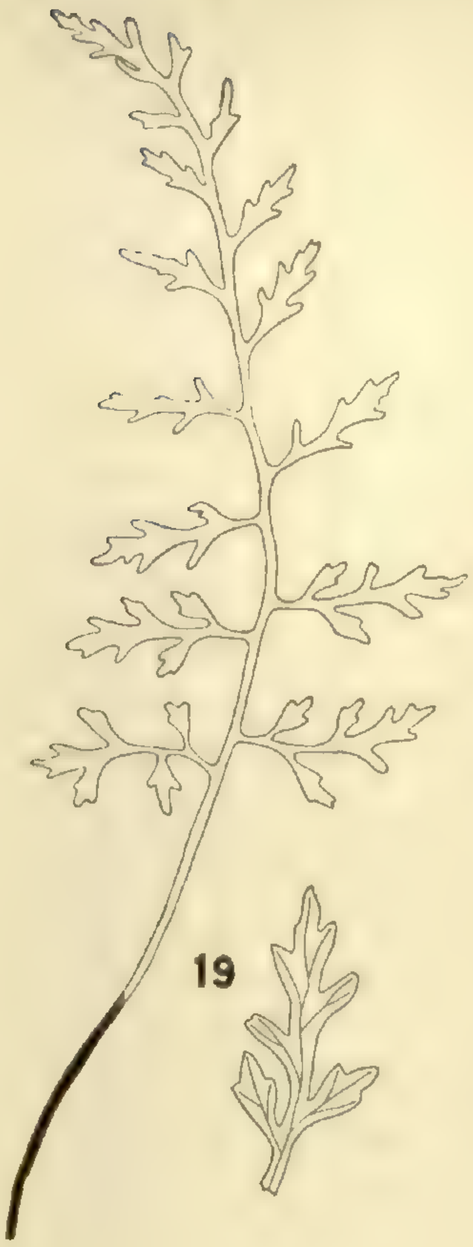
ADDITIONAL ASPLENIUMS.

16. A narrow, elongate, but normally cut phase of *A. pinnatifidum* from York Furnace, York Co., Pa., ⅔ natural size.
17. Same locality but somewhat greater reduction in size than No. 16. Further development of the tendency to narrowing and elongation has here resulted in a frond without well-marked lobes but with jagged margins. (cf. *Camptosorus rhizophyllus* forma *boycei* Wilson, This Journ. **25**: 18.) Such fronds are known to attain at times a length of 30 cm., the maximum for *A. pinnatifidum*. The successive figures 1, 6, 11, 16 and 17 bring out all the frequent phases of this species; although still others, as well as various freaks, appear occasionally.
18. A giant hybrid from Muddy Creek, York Co., Pa., ⅓ natural size. The elongate upper part of the frond with its simple lobing points unmistakably to *A. pinnatifidum* as one parent. The cutting of the lower pinnae suggests *A. bradleyi* to have been the other parent, and this is also indicated by a rather dark coloration of its sori. It is therefore perhaps a phase of *A. gravesii* with unusually long, narrow pinnae, although the broad base and deep cutting are so reminiscent of *A. montanum* as to lead to a question as to whether a cross of *A. gravesii* with *montanum* may not be represented.
19. In the York Furnace region *A. montanum* sometimes develops slender phases, a typical example of which is here reproduced, slightly below natural size.
20. The final diagram represents *A. dentatum* L. from Dade County, Florida, natural size. It is put in for comparison with No. 9, the upper pinnae of which show such a curious resemblance to those of this presumably unrelated species.

16

17

18



19

20

Appalachian Aspleniums—4.

The recommendation is frequently made that if two plants are connected by a complete series of intergradations, they should be considered as only subspecifically or varietally distinct. To follow such a plan here, however, would result in confusion, for nearly all the plants figured would then have to be classed as belonging to the earliest recognized member of the group, *A. platyneuron* (L.) Oakes, or perhaps to *A. montanum* Willdenow. This would require a system of nomenclature so complex that no one would ever use it.

In partial series such as shown in plates 1 and 2, however, names for some of the intermediates may serve a useful purpose. While the few specimens included in herbaria in 1875 could be adequately named as either *A. montanum*, *A. pinnatifidum*, or *A. bradleyi*, so many additional collections were made during the following 50 years that more names were needed. Two new ones accordingly came into use, making the two series *montanum—trudelli—pinnatifidum*, and *pinnatifidum—gravesii—bradleyi* respectively. Possibly in another like period names will be found desirable for the plants here shown to bridge the gaps between these five. For the present, however, we prefer not to propose four new names, but to designate the intermediates by expressions bringing out their positions in the series. In the preparation of dichotomous keys to the plants covered in a manual or local flora, the existence of such intermediates, as well as of cases of unusual cutting like those shown in figs. 17 to 19, should certainly be allowed for, otherwise amateurs may be misled, and perhaps overlook noteworthy hybrids or variants.

PHILADELPHIA, PA.

Brief Notes on Southern California Pteridophytes

H. H. TRACY

The usual "unusual California weather" has been very much in evidence this year (1935); we have had over twenty inches of rainfall. The rains have been well distributed over the entire period, from a very early fall rain until the present writing, April 2. The first part of the fall and winter were "unusually" warm, making possible the early starting of all vegetation. The cooler than *usual* spring has tended to continue the growth of all plants through a much longer period than we normally expect.

This type of weather has been excellent for some of our more rare Pteridophytes. It has been possible for me to make a few short trips, and, while there has not been time to work over the material collected to a final analysis, some may be interested in a few notes regarding these collections.

On March 16, 1935, the four following collections were made from the mesas near the former location of Camp Kearny, San Diego County:

No. 1245—OPHIOGLOSSUM CALIFORNICUM Prantl, growing in abundance and with some plants reaching a height of 9 cm. above ground.

No. 1246—ISOETES ORCUTTII Eat., growing in the same location as the above *O. californicum.* The habitat was a gradual slope with underground seepage, but without chance for water to accumulate into a pool. Previous collections, No. 799, that I had made of *Isoetes Orcuttii* in the region of San Diego were found growing submerged in pools formed by seasonal rains.

No. 1247—PILULARIA AMERICANA A. Br., on the edge of rain pools in the flying field near Camp Kearny, San

Diego. In an earlier collection, March, 1922, I had found this interesting plant in great abundance; this year it did not seem to be as abundant as in the former year, which was surprising to me.

No. 1250—ISOETES ORCUTTII Eat., in pools with no. 1247. I mention this additional collection of *I. Orcuttii* as this was the typical habitat in which I should expect to find this species.

The following collections were made March 16, 1935, at Costa Mesa, California, a coastal town a little less than halfway between San Diego and Santa Barbara:

No. 1253—PILULARIA AMERICANA A. Br., near Costa Mesa. This plant had been collected at various places in California, the San Diego area being the most common collecting field. Drs. Munz and Johnston in their paper "The Distribution of Southern California Pteridophyta" (AM. FERN JOURN. Vol. 13, No. 1) list, besides the areas near San Diego, the following stations: Red Hill near Uplands; near Elsinore; and in Menifee Valley, Riverside County. With this distribution it would not seem surprising to find it at almost any intervening point as is the collection just made, no. 1253, from near Costa Mesa. Here the ground left by the drying up of a winter pool is almost as thickly planted as a lawn.

Growing with this *Pilularia* was found an abundance of the little plant of the Ranunculaceae, *Myosurus minimus* var. *apus* Greene, a plant that has often made me border upon profanity because of the similarity in appearance, when young, to an Isoetes. Also *Elatine brachysperma* Gray, the "Mud Purslane," is found abundantly here.

I have collected a quantity of the *Pilularia* and shall be glad to send a sheet to any student of this group.

I spoke of the two different collections of *Isoetes* just made at San Diego, because I am quite at a loss to under-

stand the *Isoetes* of California. In 1918 I collected an *Isoetes* (no. 680) in a small meadow of the San Bernardino Mountains (referred to by Munz and Johnston, AM. FERN JOURN. Vol. 13, pg. 122); this was determined at that time as *Isoetes Bolanderi* Engelm. This determination does not seem to be accurate, as it fits much more nicely to *I. Orcuttii* Eat. Dr. Munz, in his Manual of Southern California Botany, 1935, page 12, places this collection as *I. Howellii* Engelm. This does not seem to me to be accurate as all corms examined are 3-lobed, as are those of nos. 1155 and 1246. Later I collected another *Isoetes* (no. 856) near Big Bear Lake that was quite different, which I determined as *I. Bolanderi* and which has been so called by others who have seen this material.

Two years ago I collected a small *Isoetes* (no. 1155) on the desert side of the San Bernardino Mountains. These plants were growing under the edge of a large granite boulder, where the ground might be damp for a few weeks in the spring, but never could be under water. This plant seems also to be *I. Orcuttii*, as well as the San Diego plants. San Diego is approximately at sea level, the other two stations at an elevation of 5000 and 6000 feet. *I. Orcuttii* is supposed to be partly submerged while nos. 680 and 1246 were terrestrial in habitat. The latter, no. 1246, was coastal, no. 680 in vernal meadows among a pine forest on the mountain tops, while no. 1155 was in desert conditions where moisture in the soil is only present for a short period of spring, then desert-dry the rest of the year; growing near it were such plants as *Allium fimbriatum* Wats., *Calochortus Kennedyi* Porter, etc.

Another interesting series of *Isoetes* was collected in August, 1933, along the Tioga Pass Road in the Sierra Nevada Mountains. Here, growing in a pool beside the stream which runs into Mono Pass, was a great abun-

dance of a small, stocky *Isoetes* (no. 1192). This, I felt, was *I. Bolanderi* var. *pygmaea* Clute. These plants were totally submerged and seemed to be entirely lacking in stomata. At several other places, in this same general region but in conditions varying from total submergence to almost wholly dry soil, I collected plants that seem to be very much the same. I have numbered these collections: 1192, 1193, 1194, 1195.

It has been my hope to find time to make a more careful study of these plants, but the opportunity does not seem to come. If anyone who is making an exact study of this rather difficult group would like to look over my material, I should be glad to correspond with him.

One other collection this spring is of interest. This is one made February 23, 1935, of *Adiantum pedatum* var. *aleuticum* Ruprecht. Munz and Johnston summarize the collections of this fern, which is rather rare in Southern California, as: in San Bernardino Mts. in Snow Canyon; a "Hudsonian Island of Mill Creek Canyon"; in the San Gabriel Mts. near Browns Flats; in Little Santa Anita Canyon, on Mt. Wilson; in Eaton Canyon; in Santa Barbara County "in the northern portions of the county"; and on Santa Cruz Island!

One of my Junior College students, Mr. John W. Johnson, found a plant of this fern in a small canyon near the mouth of Lytle Creek Canyon. He called it to my attention and with him I visited this unnamed canyon. We went farther than Johnson had previously gone and found an abundance of this fern.

This canyon is on the north slope of the San Gabriel range and changes quickly from Sonoran zone forms to Upper Transition forms. In less than a half mile, I found *Pellaea mucronata* D. C. Eaton, *P. andromedaefolia* (Kaulf.) Fée, *Pityrogramma triangularis* (Kaulf.) Maxon, *Cheilanthes californica* (Nutt.) Mett., *Poly-*

podium californicum Kaulf., *Adiantum emarginatum* Hook., *Thelypteris arguta* (Kaulf.) Moxley, *Woodwardia Chamissoi* Brack., *Polystichum munitum* (Kaulf.) Presl, *Adiantum pedatum* var. *aleuticum* Ruprecht, and lastly, *Adiantum Capillus-Veneris* L. was found by Johnson the next day. I kept a sharp lookout for *Asplenium vespertinum* Maxon, for this had been found once in this general area (Johnson 80 and 2172), but then on the southern slope of the range. *Porella* sp. was also most abundant in this place.

FULLERTON, CALIFORNIA.

The Proper Name of the Water Horsetail[1]

JOHN H. SCHAFFNER

Several names have been applied to the water horsetail in the past and there is apparently still some question as to which is the proper one. In order to determine the correct scientific name, the writer has attempted to study the older references following the publication of the two names, *Equisetum fluviatile* and *E. limosum*, by Linnaeus in the Species Plantarum, in 1753.

In 1921, Fernald and Weatherby traced the validity of the name *E. limosum* L. back to Roth, 1800, and raised the question whether under the International Rules our water horsetail should not bear that name rather than *E. fluviatile*, the name used in both the last edition of Gray's Manual and in Britton and Brown's Illustrated Flora. But as will appear below Ehrhart had apparently settled the question properly in favor of *E. fluviatile* L. a number of years before Roth made a decided muddle of it.

---

[1] Papers from the Department of Botany, The Ohio State University, No. 364.

The specific name *E. fluviatile* was first published by Linnaeus in 1737. (Flora Lapponica, p. 310, No. 393). In 1753, Linnaeus included *E. fluviatile* in his Species Plantarum, p. 1062 (No. 4), and followed this with another species, *E. limosum* (No. 5). Both of these names were also included in the same sequence in the second edition of the Species Plantarum, 1763–4, (p. 1517, Nos. 4, 5). From the diagnosis given, it is certain that Linnaeus used *E. fluviatile* for the branched form and *E. limosum* for the unbranched. It was soon recognized by various botanists that the two forms were not distinct species and this resulted in confusion as to the choice of the proper name, especially since Ehrhart introduced a new name, *E. heleocharis*, to include the two and because many botanists thought that Ehrhart's *E. telmateia* was the same as *E. fluviatile*.

Apparently Pollich, in 1777, was the first to prefer the name *E. fluviatile* and to discard *E. limosum* since he does not use the latter in his "Historia Plantarum in Palatinatu Electorali Sponte Nascentium Incepta." (Bd. II, p. 8). In 1783, Ehrhart pointed out that the branched *E. fluviatile* and the unbranched *E. limosum* were forms of the same species and proposed the name *E. heleocharis* for the aggregation. (Hannov. Mag., Stück 18, p. 286. See also "Beiträge zur Naturkunde" Bd. II. p. 159, 1788).

In 1787, Ehrhart said (Beiträge, Bd. I. p. 68): "*Equisetum limosum* L. ist eine Abart von dessen [Linnaeus'] *E. fluviatile*, nicht aber von seinem *E. palustre*, von welchem letzeren es so sehr, als immer ein Wolf von einem Fuchse, ein Pferd von einem Esel und ein Haase von einem Kaninchen verschieden ist." Here then we have a definite settlement of the specific nomenclatorial question, since *E. fluviatile* is named the species and *E. limosum* is reduced to the status of a variety.

Ehrhart was by far the best student of the Equiseta from the time of Linnaeus to Alexander Braun. In regard to the absurd confusion of *E. fluviatile* with *E. telmateia*, Ehrhart in 1788 wrote (Beitrage, Bd. II, p. 159): "In Ohne fand ich mein *Equisetum Heleocharis*, welches Viele mit meinem *E. Telmateia* für eines halten, ungeachtet diese 2 Pflanzen wie Tag and Nacht verschieden sind." In 1789, Leers used only the name *E. fluviatile* in the Flora Herbornensis, Ed. II, p. 224.

In the meantime Ehrhart was evidently beginning to see the error of his way in proposing the name *E. heleocharis*, for in 1792 (Beitrage, Bd. VII, p. 96) he uses only the name *E. fluviatile* L., following a strict code of priority and discarding *E. limosum* entirely and his own substitute, *E. heleocharis.* There can be no question but that he was following his conclusion of 1787 when he reduced *E. limosum* to the status of a variety.

Now in 1800, Roth muddled things up in general, disregarding the disposition that Ehrhart had made of the case. In Tentamen Florae Germanicae, Tomus III, p. 9, he united Linnaeus' two species under the name *E. limosum*, citing as syonyms *E. fluviatile* and *E. heleocharis.* However he transferred the name *E. limosum* to the branched form and at the same time introduced a new varietal name, *E. limosum*, β *aphyllum* Roth, for the unbranched form which was the true *E. limosum* of Linnaeus. Even if the matter had not been settled before by Ehrhart, such unscientific bungling could not be tolerated under any rational procedure.

Since 1800, both names have been used from time to time up to the present, and even *E. heleocharis* Ehrh. was still in use in Europe until recently. The correct name, *E. fluviatile* L., was used by various authors; among them Wahlenberg, 1812, Flora Lapponica, p. 398; G. F. W. Meyer, 1836, Chloris Hanov. p. 668;

Newman, 1844, Phytologist, p. 689; Hartman, 1854, Handbok i Skandin. Flora, p. 232; Schur, 1866, Enum. Plant. Transsilvaniae, p. 821; Britton, 1901, Flora Northern States and Canada, p. 23; Eaton, 1902, Fern Bull. 10: 71.

It is evident then that without going back to Linnaeus, which would establish the strict priority name, Ehrhart, by reducing *E. limosum* to the status of a variety in 1787, and using *E. fluviatile* L. exclusively in 1792, determined the latter as the correct designation for the water horsetail.

COLUMBUS, OHIO.

A List of Varieties and Forms of the Ferns of Eastern North America

C. A. WEATHERBY

(*Continued from p. 69*)

DRYOPTERIS NOVEBORACENSIS (Linnaeus) A. Gray, Manual 630 (1848). *Polypodium n.* Linnaeus, Species Plantarum 1091 (1753). *Thelypteris n.* Nieuwland, American Midland Naturalist **1**: 226 (1910).—Fronds not fragrant.

F. FRAGRANS (Peck) Burnham, American Fern Journal **6**: 102 (1916). *Aspidium noveboracense* var. *f.* Peck, New York State Museum Report **28**: 84 (1876).—Fresh fronds fragrant; not distinguishable in dried condition.

There is also a nameless fragrant form of *D. simulata,* a detailed account of which, by Miss Corne, may be found in this JOURNAL **15**: 21 (1925).

DRYOPTERIS THELYPTERIS (Linnaeus) A. Gray, l. c. *Acrostichum T.* Linnaeus, Species Plantarum 1071 (1753). *Thelypteris palustris* Schott, Genera Filicum under plate 10 (1834).—Blade glabrous; scales, if present, narrow; segments oblong, often broadly so, about half the veins of the fertile ones forking; indusium glandular-toothed or sometimes glandular-ciliate.—Eurasia, not known in America.

Var. **pubescens** (Lawson) A. R. Prince ms., n. comb. *Lastrea Thelypteris* β *p.* Lawson, Edinburgh New Philosophical Journal **19**: 277 (reprint 21) (1864). *Thelypteris palustris* var. *p.* Fernald, Rhodora **31**: 34 (1929).—Blade pubescent, especially on the midribs beneath, mostly without scales, not fragrant; veins of fertile segments nearly all simple; indusium ciliate, not glandular.—The common marsh fern of the northeastern United States; also in eastern Asia.

F. **Pufferae** (A. A. Eaton) A. R. Prince ms., n. comb. *Nephrodium Thelypteris* f. *P.* A. A. Eaton, Fern Bulletin **10**: 78 (1902). *Thelypteris palustris* f. *P.* L. B. Smith, Rhodora **30**: 16 (1928).—Tips of blade and of pinnae variously crested.

F. **suaveolens** (Clute) A. R. Prince ms., n. comb. *Nephrodium Thelypteris* f. *s.* Clute, Fern Bulletin **18**: 87 (1910). *Thelypteris palustris* f. *s.* Fernald, Rhodora **23**: 165 (1921).—Fresh fronds fragrant.

Var. **Haleana** (Fernald) Broun ms., n. comb. *Thelypteris palustris* var. *H.* Fernald, Rhodora **31**: 34 (1929).—Segments usually linear-oblong, numerous and closely set; midrib beneath often with broad brown or tawny scales at the bases of the segments; fertile veins commonly forked.—Florida to Louisiana; also in Bermuda. Differs from the European type in the generally pubescent blade, narrow segments, broad, often persistent scales, and merely ciliate indusium.

In addition to his *Lastrea Thelypteris* β *pubescens*, Lawson distinguished two other varieties, *glabra* and *intermedia*. I have yet to see a perfectly glabrous American specimen, but in some the pubescence is scanty and hard to see; presumably Lawson had something of this sort. Var. *intermedia* is described as also glabrous and as having the blade narrowed below. It may refer to a not uncommon state in which the blade is broadest near the middle, three or four pairs of the lower pinnae being progressively reduced in size, the lowermost only about half as long as the middle pinnae.

In *Filix Thelypteris*, var. *linearis* Farwell, Papers Michigan Academy **2**: 14 (1923), the segments are said to be linear-oblong as against broadly oblong and 8–14 mm. long, in these respects approaching *D. Thelypteris* var. *Haleana*. Farwell's *Filix Thelypteris f. frondosa*, *l.c.* is, from the description, founded on imperfectly fertile, but otherwise normal, fronds.

DRYOPTERIS LINNAEANA Christensen, Index Filicum 275 (1906). *Polypodium Dryopteris* Linnaeus, Species Plantarum 1093 (1753). *Thelypteris Dryopteris* Slosson, in Rydberg, Flora Rocky Mountains 1069 (1917).

In the Fern Bulletin **16**: 85 (1908) H. W. Jewell proposed, under the name *Phegopteris Dryopteris*, f. *interrupta*, a new form "in which the two lower pinna [sic] are nearly two inches below the second pair, giving the plant a queer look." Lawson, Edinburgh New Philosophical Journal **19**: 109 (reprint 10) (1864) described a *Polypodium Dryopteris* var. *erectum* which he said had a rigid, erect frond on a very stout stipe and which resembled *P. Robertianum* in general aspect but was not at all glandular. Presumably this is the state of the oak fern with the lower pinnae little larger than the upper, which has sometimes been mistaken for *D. Robertiana*.

Phegopteris Dryopteris var. *minor* (Decandolle) Farwell, American Midland Naturalist **12**: 292 (1931), is the same as *D. Robertiana*.

DRYOPTERIS NORMALIS Christensen, Arkiv för Botanik 9, no. **11**: 31 (1910); Monograph Dryopteris 128 (1913). *D. patens* of earlier American authors, not Swartz.—Lower pinnae broadest at base; segments mostly with 6 to 8 pairs of veins; indusium densely hairy.—South Carolina to Texas.

Var. HARPERI Christensen, Monograph Dryopteris 128 (1913).—Lower pinnae somewhat narrowed at base; indusium sparsely hairy.—Georgia.

Var. Lindheimeri (A. Braun) Christensen, l. c. Lower pinnae somewhat narrowed below; segments mostly with 9 to 12 pairs of veins; indusium strongly hairy.—Texas.

In Bulletin Torrey Botanical Club **33**: 477 (1906) A. A. Eaton published a *D. patens* var. *glandulosa*, described as having rachis, pinnae and indusia covered with glandular hairs instead of the usual white glandless pubescence. This is not accounted for in Christensen's Monograph and there is no specimen of it in Eaton's herbarium. What it may be I do not know. At that time, Eaton was applying the name *D. patens* to what we now know as *D. normalis;* but I have seen no glandular specimens of this species.

Dryopteris reptans (Gmelin) Christensen, Index Filicum 290 (1905). *Polypodium r.* Gmelin, Systema Naturae **2**, pt. 2: 1309 (1791).—Fronds from the same rootstock unlike, some short-stalked, prostrate and usually not fruiting, others long-stalked, with distant pinnae and usually fertile.

Var. conformis Christensen, Monograph Dryopteris 168 (1913).—Fronds all alike, all long-stalked, pinnae rather close together.

Polystichum acrostichoides (Michaux) Schott, Genera Filicum under plate 9 (1834). *Nephrodium a.* Michaux, Flora Boreali-Americana **2**: 267 (1903).—Lamina once pinnate; pinnae flat, acute to acuminate at tip, midrib not projecting, auricled at the base on the upper side, their margins finely toothed, the teeth tipped with short bristles in the plane of the pinnae; only the reduced upper pinnae fertile.

F. crispum Clute, Our Ferns in their Haunts, 107, 317 (1901).—Margins of pinnae crisped and ruffled.

F. cristatum Clute, Fern Bulletin **20**: 81 (1913).—Tips of blades crested.

F. Gravesii Clute, op. cit. **20**: 50 (1912).—Pinnae with a broad square or notched tip, the midrib projecting as a spine-like bristle.

F. recurvatum Clute, op. cit. **12**: 79 (1904).—Edges of pinnae folded back along the line of the midrib for

about a third of their length, the somewhat tubular tip thus formed bent back toward the upper surface of the pinna.

F. LANCEOLATUM Clute, op. cit. **20**: 24 (1912).—Pinnae often without a basal lobe, the margins irregularly toothed, without bristles, these borne on the upper surface of the pinnae along false veins, one on each side of the midrib, and projecting upward at right angles to the plane of the pinna.

A curious form appearing as if the leaf-tissue had grown beneath and beyond the normal margin, leaving that, with its bristles, stranded, as it were, on the upper surface:

F. INCISUM (A. Gray) Gilbert, List North American Pteridophytes 19 (1901). *Polystichum acrostichoides*, var. *i*. A. Gray, Manual 632 (1848).—Pinnae coarsely and deeply toothed, the lower often fertile at tip.

F. MULTIFIDUM Clute, Fern Bulletin **15**: 72 (1907).—Pinnae pinnatifid to a narrow wing along the midrib; lobes lanceolate, oblanceolate, or oblong, not auricled.

Several other forms might be distinguished in this variable and plastic species. Rev. F. W. Gray has in course of preparation a study which will, no doubt, account for them.

POLYSTICHUM LONCHITIS (Linnaeus) Roth in Roemer, Arkiv für Botanik **2**, pt. 1: 106 (1799). *Polypodium* L. Linnaeus, Species Plantarum 1088 (1753).—Sori about half-way between midrib and margin.

F. MARGINALE McColl, American Fern Journal **14**: 107 (1924).—Sori near the margin.

POLYSTICHUM BRAUNII (Spenner) Fée, Genera Filicum 278 (1850–52). *Aspidium B.* Spenner, Flora Friburgensis, **1**: 9, pl. 2 (1825).—Lamina rather thin, the veins distinctly seen in dried specimens; scales of the base of the stipe of firm texture with elongate-linear cells, thick cell-walls and very narrow lumina; thread-like scales of the rachis more numerous than broad ones. European.

Var. PURSHII Fernald, Rhodora **30**: 30 (1928).—Blade rather thick, the veins usually not easily seen in dried specimens; scales of the base of the stipe thin with short-linear to oblong cells with thin walls and broad lumina; broad scales of the rachis more numerous than thread-like ones. The American plant. The characters are taken from Prof. Fernald's discussion.

DENNSTAEDTIA PUNCTILOBULA (Michaux) Moore, Index Filicum XCVII (1857). *Nephrodium p.* Michaux, Flora Boreali-Americana **2**: 268 (1803).—Blade bipinnate-pinnatified; pinnules oblong, the basal not reduced; segments of the third order with a few short and broad teeth.

F. CRISTATA (Maxon) Clute, Fern Bulletin **11**: 24 (1903). *D. p.* var. *c.* Maxon, op. cit. **7**: 63 (1899).—Tips of blade and of pinnae crested.

F. SCHIZOPHYLLA (Clute) Rugg, AMERICAN FERN JOURNAL **2**: 91 (1912). *Dicksonia pilosiuscula* f. *s.* Clute, Fern Bulletin **10**: 97 (1902).—Teeth of segments of the third order narrow and elongate.

F. **nana** (Gilbert), n. comb. *Dicksonia pilosiuscula,* f. *n.* Gilbert, Fern Bulletin **13**: 101 (1905).—Pinnules cut as in f. *schizophylla,* those toward the base of the pinnae much reduced.

F. POYSERI Clute, Fern Bulletin **19**: 8 (1911).—Blade bipinnate-bipinnatifid; pinnules ovate; segments of the third order regularly and deeply lobed.

(To be continued)

GRAY HERBARIUM.

Recent Fern Literature

A new pocket guide to northeastern ferns[1] furnishes an interesting contrast to the two recent fern books already noted in our pages, the inaccurate and misleading "American Ferns" and the highly technical "Ferns of the vicinity of New York." In this 4 x 6½ inch, 100 page booklet sixty-five species are illustrated by line drawings

[1] Ferns of Northeastern United States, by Farida A. Wiley, American Museum of Natural History, New York City. Privately published, 1936. **$1.00.**

bringing out in many cases the habit, the features of the lower part of the frond, a pinna showing sorus-arrangement, and a cross section of the stipe. The order is systematic, beginning with *Ophioglossum* and ending with *Polypodium polypodioides*, but there is a brief artificial key. Under each species the more important diagnostic features and the habitat are briefly characterized.

Many of the drawings are well executed, and really look like the plants. The beginner will have a hard time, however, in distinguishing *Botrychium obliquum, dissectum,* and *multifidum* on the basis of the pictures or data given, particularly since the illustrations of the first and last have been interchanged. The plant sketched as *Dryopteris clintoniana* does not show the features of that species, and must have represented some hybrid. The drawings of *Dryopteris spinulosa* and *D. campyloptera* have also been interchanged. The distinctive features of *Pellaea glabella*, such as nearly ternate lower pinnae, are not shown in its drawing.

The methods of distinguishing similar species given under "Remarks" are not always adequate. The opposite segments of the sensitive fern furnish a better means of telling it from the chain fern than the features given. An error made in Gray's Manual, that the veinlets of the marsh fern are always forked, is perpetuated. And *Athyrium asplenioides* does not have the blade broadest at about the center, as stated.

Some geographic errors have crept in. Rusty woodsia sometimes grows below 1000 feet, *Asplenium pinnatifidum* is not limited to mountains, and *Polypodium polypodioides* does not grow in the ground nor is it known in forests of Pennsylvania. There are also slips such as the use of spore cases instead of sori in the foreword and pinnules for what fern authorities term segments, and misprints, such as A. instead of J. as the first initial of a

recent writer on ferns. No credit is given to Dr. Waters for his introduction of stipe cross sections as an aid in diagnosis, nor is the existence of the American Fern Society or its Journal mentioned. The work should prove of value to beginners endeavoring to learn the names of the ferns encountered on their field trips, but we wish it had been more carefully edited.

An elaborate study of the acidity of the soils of Tennessee ferns has recently been published.[2] In general, the results confirm those of earlier workers, but a few new relations are noteworthy. *Cheilanthes lanosa* showed minimacid to subalkaline reaction, corresponding to the fact that west of the Appalachians it may grow on limestone, (though farther east it seems limited to non-calcareous rocks). Preference for alkaline conditions was shown by several species not previously studied from this standpoint, such as *Equisetum arvense, Selaginella apoda,* and *Dryopteris thelypteris.* On the other hand, *Lycopodium lucidulum, L. obscurum* and *L. porophilum* were limited to mediacid soils. Several species showed such a wide range that no soil-reaction preference can be assigned to them, notably *Cystopteris fragilis, Athyrium acrostichoides,* and *Polypodium polypodioides.*

Alston, A. H. G. *The Selaginellae of the Malay Islands. I. Java and the Lesser Sunda Islands.* Bulletin du Jardin Botanique de Buitenzorg, Serie III, Vol. XIII, Livr. 3. December, 1935.

In a note published last year reviewing a paper of Dr. Alston's on African ferns, it was of some interest to discover certain familiar American fern types in such a far-off region. In this paper on the species of Selaginella of

[2] Soil acidity at the roots of some Tennessee Pteridophytes. Nathan H. Woodruff, Journ. Tenn. Acad. Sci. 10 (4) 276–290, 1935 and 11 (1) 31–52, 1936.

Java and adjacent islands, no familiar name was discovered. Twenty-two different species are keyed out, one of which is reported as climbing. It is a little surprising to find a monographic treatment of a large genus of this sort which does not include a single species described as new. But it is noted that the Javan species have been carefully described in previous records. Later papers are scheduled to deal with the Selaginellae of other Malayan Islands.

Looser, Gualterio. *The genera Pteris and Histiopteris and their Chilean representatives. (Los Géneros Pteris e Histiopteris y sus Representantes Chilenos).* 1936.

In another paper recently received from Dr. Looser, the probability of a recent Chilean climatic change, due to an Antarctic glacial period, is discussed. In this paper on the genus *Pteris*, nothing common to both North and South America is reported. In fact, it is distinctly stated that *Pteridium* is not represented in Chile. Considering the generally world-wide distribution of *Pteridium*, this is a little surprising.

Reference in this paper to the fact that Christensen recognizes 269 species of *Pteris*, as it has been understood, raises the question as to what will happen to this large number if Dr. Small is generally followed in applying the name *Pteris* to the genus including common brakes, as Mr. St. John noted in his recent review of Dr. Small's book on "The Ferns of the New York Region."

Those of us who can read German and have access to volume 42 of the "Berichte" of the Botanical Society of Switzerland will be interested in M. Rickli's article therein (pp. 339–356) on the distribution of fernworts in extreme northern Eurasia. Fifty-four species extend into the actual Arctic between 60° and 80° north latitude. The greatest concentration is in northern Scandinavia

where 27 species occur. Rickli believes there is no climatic reason why they should not have gone still farther north; only lack of land on which to grow has stopped them. There is no marked parallel between the arctic and alpine fern floras. Of the 10 extreme arctic species only half are found in the high Alps; and of the 19 species which extend above timber line in Switzerland only 4 appear in the extreme Arctic. On the other hand, 19 of the species which reach the borders of the Arctic have an almost unbroken distribution from the latitude of the Alps thither. Because of local conditions, the occurrence of many species in the Arctic is sporadic; but there are no Arctic endemics.

Dr. Ching, having split off several genera from *Polypodium*, is now turning his attention to the great group of *Dryopteris*. The first result is the reviving of Kunze's genus *Hypodematium*, based primarily on the swollen base and anatomy of the stipe—or, as Dr. Ching puts it: "the limestone dwelling habit and the peculiarly swollen, scaly base of stipe combined mark the genus *Hypodematium* as being very unique among all other known fern genera, with which it may share similarities in other respects." It is based on the wide-spread tropical species *Dryopteris crenata*, with which are associated two local Chinese species. One, *H. shantungense*, possesses a somewhat cystopteroid indusium. Dr. Ching believes the genus is most closely related to *Cystopteris*.[3]

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[3] Ching, R. C. On the genus *Hypodematium* Kunze. Sunyatsenia 3: 3–15, 3 pls. (1935).

Shorter Notes

A NEW ASPLENIUM FROM KENTUCKY.—**Asplenium kentuckiense** McCoy, sp. nov. Textura et colore *A. Bradleyi* simillimum. Folia caespitosa, erecta vel subpatentia, 8–20 cm. longa, oblongo-attentuata, basin versus pinnata, pinnis petiolulatis, superne pinnatifido-lobata, apice serrata. Pinnae oblongae, subintegrae, 8–15 mm. longae, basi 3–6 mm. latae, inferiores baseos latere superiore auriculatae. Stipes brunneus vel niger, nitidus. Rachis inferne stipiti similis, superne plana viridisque. Sporangia locupletissima, faciem inferiorem pinnarum tegentia; sporae fuscae. Lapidem arenarium cum *A. pinnatifido* incolit.

Rhizome short, creeping, 1–2 mm. in diameter. Fronds tufted, erect and spreading, 8–20 cm. long, oblong-attenuate, with 4–6 pairs of stalked pinnae at the base, passing to pinnatifid lobes, and attenuate-serrate toward the apex. Pinnae oblong, subentire, 8–15 mm. long, 3–6 mm. wide at base, the lower auricled above. Stipe brown to black, shining. Dark color extending well into the lamina. Rest of the rachis flat and green. Sporangia plentiful, covering the backs of the pinnae; spores dark brown. The texture and color near that of *A. Bradleyi*. Found on sandstone cliffs with *A. pinnatifidum*.

This species can be separated from its near relatives *A. Gravesii* and *A. Trudelli* by the following characteristics: color of the stipe, texture of the frond, and the number of pairs of pinnae that are definitely stalked. *A. Trudelli* has one-third of the stipe brown, texture of the frond thickish, spores light brown, pinnae serrate, and 2–3 pairs of stalked pinnae. *A. Gravesii* has the stipe brown-black all the way to the lamina, texture of the frond intermediate, spores dark brown, pinnae slightly serrate, and 3–5 pairs of definitely stalked pinnae.

The type specimen was collected Oct. 10, 1934, Keyser Creek, Boyd Co., Kentucky; other specimens were collected June 6, 1934, Buzzard Roost, Calloway Co., Kentucky (over 400 miles from the first) and June 11, and

ASPLENIUM KENTUCKIENSE (½ ACTUAL SIZE).
COLLECTED OCT. 10, 1934, KEYSER CREEK, BOYD COUNTY, KENTUCKY,
GROWING ON SANDSTONE.

June 19, 1935, in Rowan County, Kentucky. The type specimen is in the herbarium of the Philadelphia Academy of Sciences. Another specimen has been deposited in the herbarium of the Morehead State Teachers College. The other material at present is in my herbarium.

The writer is indebted to Dr. Edgar T. Wherry for his critical examination of the above specimens, for submitting specimens of rare *Aspleniums* that are not found in the state, and for valuable assistance in establishing this species. Further the writer is indebted to Rebecca Scott and Dr. Lucy A. Whitsel for their valuable help in latin description.—THOS. N. MCCOY, *Catlettsburg, Ky.*

A NOMENCLATORIAL TRIFLE.—Among the "Nomina specierum dubiarum" in Christensen's invaluable "Index Filicum" is "Pteris thalictroides Muhl.," cited from a paper entitled "Index Florae Lancastriensis" by Henry Muhlenberg, D.D., which was read at a meeting of the American Philosophical Society February 18th, 1791, and published (1793) in Vol. III of their "Transactions." The names of about 1100 species growing wild in or near Lancaster, Penna., are given, arranged according to the Linnaean system, but without description. Twenty-three species of "Filices" are listed, exclusive of *Equisetum* and *Lycopodium*, and along with *Pteris aquilina* and *caudata*, a third—*P. thalictroides*, Schreberi. The name, I think, is not to be found in any of Schreber's publications and the attribution of it to him is probably explained by Muhlenberg's statement in his introduction that when he "found no name in Linne's [sic] system, I took it from other works lately printed, or from Doctor Schreber's letters, with whom I have opened a correspondence. He is professor Botanices et Historiae naturalis at Erlangen, editor of the Genera Plantarum

Linnaei, and, without doubt, one of the first botanists in Europe.''

In 1813 Muhlenberg published his ''Catalogue of the Hitherto Known Native and Naturalized Plants of North America,'' again without descriptions. Our dubious *Pteris* is no longer included, but *Pteris atropurpurea* and *P. gracilis* are. As *Pellaea atropurpurea* grows in Lancaster Co., nothing is easier than to assume that it must have been the fern for which the now discarded name was intended. ''Thalictroides,'' if in allusion to the basal leaves, would not be inappropriate, which adds weight to the assumption.

Still, however plausible, it is so far a suggestion only. Perhaps it was some abnormal form of bracken he had in hand.

The Philosophical Society possesses a series of manuscript volumes of Muhlenberg's notebooks. Looking over them not long ago I came across a MS. which might have been the basis of the paper read at the meeting of February 18th, 1791. ''Pteris thalictroides Schreberi''[1] was there as printed, and across it, written not quite so carefully, ''Pteris atropurpurea,'' as though the author at some later date, had added the emendation. So the 'plausible suggestion' becomes a certainty and, on the writer's own authority, we may equate *Pteris thalictroides* Muhl. with *Pellaea atropurpurea* (L.) Link. and let it pass into synonymy.—ARTHUR N. LEEDS, *The Academy of Natural Sciences of Philadelphia.*

A NEW EASTERN STATION FOR PILULARIA AMERICANA.—As brought out recently by Dr. Small,[2] there is in the

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[1] In both the MS. and the published ''Index'' the first syllable is spelled ''*tal*'' and not ''*thal.*''

[2] Small, John K. Pilularia rediscovered in the East. Journal of the New York Botanical Garden 36: 141–142. 1935.

herbarium of the New York Botanical Garden a specimen of *Pilularia americana* A. Br., collected at Winder, Georgia, about 35 years ago. Except for this record, the plant has not been reported from east of the Mississippi River, and is, indeed, not at all well known as far east as Arkansas, where it was collected by Thomas Nuttall in 1818 or 1819. The Winder locality has not been rediscovered.

On March 15, 1936, the writer, with Mr. Joseph H. Pyron of the University of Georgia, discovered *Pilularia* growing in great abundance in shallow pools near Logansville, Walton Co., Ga., about 15 miles southwest of Winder. Here several acres of flat granite rocks are exposed, and shallow soil pockets are formed in the irregular surface of the rock. The most conspicuous plant in the shallow soil is the brilliant red *Diamorpha cymosa.* Certain of the soil pockets have the nature of more or less permanent pools, due apparently to small springs on the upper side of the outcrop, and in these the dominant plant is a species of *Isoetes* (now thought to be *I. Engelmanni* A. Br.), which is so abundant that it forms a thick turf in the shallow water.

The *Pilularia* occurs in the mud of the same pools, creeping extensively among the crowded plants of the *Isoetes.* The former is very inconspicuous, and is not easily seen until some of the mud is washed out of a mass of the plants, when the abundant sporocarps become evident.

As Dr. Small suggested in the paper mentioned above, this plant may be much more widely distributed than is now known. In view of its habitat at the Logansville station, it should be sought throughout the granite region of central Georgia, wherever permanent shallow pools occur in the rock outcrops.—ROGERS MCVAUGH, *University of Georgia.*

TWO INTERESTING FERNS OF LYNDEBORO, NEW HAMPSHIRE.—Lyndeboro has a line of ledges that are 99% pure silica, from which "Lyndeboro glass" was made. On these ledges we have found Ebony Spleenwort (*Asplenium platyneuron*) with plain and also with incised edges. In November, 1934, Mrs. Gladys Emery Foote found, on the northern slope of one of these ledges, under a hemlock tree in deep shade, a fine plant of *Polypodium virginianum*, forma *cambricoides*. A foot or more away were one or two others, bearing six or more fronds. There were beds of the common polypody on the ledge but not near by.

The fragrant marsh fern came to my attention nearly twenty years ago, when I was picking every fern I could find and taking the fronds home to identify. Two fronds left on the table over night wilted and so filled a large room with their fragrance that I felt sure we had *Dryopteris fragrans*—only to be disappointed. The fragrant form seems to be fairly frequent here, not always near the common marsh fern. One colony of a dozen or more fronds was found in a pine grove with no other ferns of any kind near. An odd arrangement was found under an old stone wall with only the fronds above the stipe showing on the sunny side of the wall. Plants of the fragrant form are well scattered over the shaded, damp portion of my wild garden, not thickly in any part of it, but in plenty. Years ago a friend who knew sweet grass when she saw it helped me hunt for the source of the elusive odor which we now know came from these ferns. The odor is strongest as they wilt.—ELIZABETH H. RICHARDS, *South Lyndeboro, New Hampshire.*

MASSACHUSETTS FERN IN WAYNE COUNTY, PENNSYLVANIA.—As the known range of the Massachusetts Fern is somewhat limited, I am glad to be able to report a new locality. The fern grows over a rather extensive area in

a bog near Poyntelle, about four miles south of Lake Shehawken. It grew in large patches here and there between the ubiquitous Cinnamon Fern. The Crested Fern, *Dryopteris spinulosa* and *D. intermedia* were common on the drier spots and along the edges of the bog were the slender spikes of the Marsh Fern.

Rhododendron maximum occupied the underwood. In northern Wayne County this shrub is found only in swamps, marshes and bogs.

The elevation above sea level at Poyntelle is 2050. I am quite sure that this is the highest reported elevation for the Massachusetts Fern.—W. L. DIX, *Trenton, New Jersey.*

Father Julius A. Nieuwland, C. S. C., died on June 11, 1936, at the age of 58. He was a member of the faculty of Notre Dame University, serving successively as Professor of Botany, Dean of the College of Science, and Professor of Organic Chemistry. Among fern students he is known as the author of numerous new combinations, especially under *Thelypteris*, being especially successful in bringing to light long overlooked publications of generic names.

American Fern Society

As duly announced, a trip of the Society was held in the vicinity of Jamesville, New York, on Sunday, June 21st, with ten members in attendance: R. T. Clausen, E. T. Emmons, Miss N. B. Kimber, I. W. Knobloch, H. E. Ransier, R. P. St. John, William Spawn, Mrs. C. Y. Tanger, E. T. Wherry and Miss M. F. Wright, and several visitors. Under the guidance, first, of Dr. Mildred E. Faust of Syracuse University, we visited a large colony of *Scolopendrium* in the State Park, finding

it in fair shape, though badly affected by drought. Magnificent specimens of *Athyrium pycnocarpon* and *Dryopteris goldiana* were also seen here, in moister situations. Next we visited the basin of White Lake, where the hart's-tongue was formerly abundant, but found this colony reduced nearly to the vanishing point, apparently through some climatic change. In view of the fact that recent amateur writings have implied the existence of some relation between this fern and oak trees, special watch was kept as to tree associates, and while no oaks were to be seen, the American linden was found to be a good guide to the presence of hart's-tongue. Under the arbor-vitae trees on steep north-facing slopes around White Lake we were so fortunate as to find numerous plants of *Botrychium lunaria* var. *onondagense*.

In the afternoon Mr. Ransier guided us to the neighborhood of Evergreen Lake, and showed us additional occurrences of the *Botrychium*, including some very large individuals; an extensive isolated colony of *Cryptogramma stelleri*, on a seemingly dry limestone cliff; and several other ferns of rare occurrence in the region. The state law forbidding the collection of hart's-tongue fern was faithfully obeyed, but there being no law against collecting spores, these were obtained by several of the party who are finding the raising of ferns an attractive pursuit.—E. T. WHERRY.

Mr. F. Willard Bowman, 245 Beverly Road, Douglaston, New York, would like to get living specimens of any ferns of the northeastern states which he has not already in his collection and will give in exchange living duplicates of most of those in the following list. The nomenclature is that of Small's "Ferns of the Vicinity of New York."

1—*Polypodium virginianum.*
2—*Pteris latiuscula.*
3—*Adiantum pedatum.*
4—*Pellaea atropurpurea.*
5—*Anchistea virginica.*
6—*Lorinseria areolata.*
7—*Asplenium cryptolepis.*
8—*Asplenium Trichomanes.*
9—*Asplenium platyneuron.*
10—*Athyrium asplenioides.*
11—*Athyrium angustum.*
12—*Diplazium acrostichoides.*
13—*Camptosorus rhizophyllus.*
14—*Thelypteris noveboracensis.*
15—*Thelypteris Thelypteris.*
16—*Dryopteris marginalis.*
17—*Dryopteris cristata.*
18—*Dryopteris Goldiana.*
19—*Dryopteris intermedia.*
20—*Dryopteris spinulosa.*
21—*Dryopteris campyloptera.*
22—*Polystichum acrostichoides.*
23—*Polystichum Braunii.*
24—*Phegopteris hexagonoptera.*
25—*Phegopteris Phegopteris.*
26—*Phegopteris Dryopteris.*
27—*Cystopteris fragilis.*
28—*Cystopteris bulbifera.*
29—*Woodsia ilvensis.*
30—*Woodsia obtusa.*
31—*Dennstaedtia punctilobula.*
32—*Onoclea sensibilis.*
33—*Pteretis nodulosa.*
34—*Osmunda regalis.*
35—*Osmunda cinnamomea.*
36—*Osmunda Claytoniana.*
37—*Botrychium obliquum.*
38—*Botrychium dissectum.*
39—*Botrychium multifidum.*
40—*Botrychium virginianum.*
41—*Scolopendrium vulgare.*

Mr. Bowman invites anyone interested to visit his fern garden.

New members:

Andrus, Miss Catherine, Berkshire School, Sheffield, Mass.
Buell, J. H., Appalachian Forest Experiment Station, 233 Federal Building, Asheville, N. C.
Edson, Mrs. Josephine Z., 54 Fairview Ave., Rochester, N. Y.
Gordon, Dr. Robert B., Ohio State University, Columbus, Ohio.
Hiss, Mrs. Berry, Hill and Hollow Farm, Hyde Park, N. Y.
Jehlen, C. F., 12 Madeline Parkway, Yonkers, N. Y.
Ryan, Glen H., 392 Sinex Ave., Pacific Grove, Cal.
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R. C. BENEDICT E. J. WINSLOW

W. R. MAXON C. A. WEATHERBY

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American Fern Journal

Vol. 26 October–December, 1936 No. 4

The Hart's-Tongue in Tennessee
1878-1935

Eleanor McGilliard

The Hart's-tongue in Tennessee, though discovered near South Pittsburg about 1878 and appearing in literature several times between that date and 1911, has scarcely been heard from since. During the past few months, the writer has attempted to collect the available history of the fern in this, the only southern station, as well as to determine its present status and perhaps its future.

The Fern To-day

Trips to the "Sink" in 1933 and 1934 were the means of interesting me in the fern and a final trip for more nearly complete data was planned for May 11, 1935. The day dawned clear and pleasantly cool, and we left Chattanooga early in the morning. My good friend Mrs. Fred. Porter, and two of my students at the University of Chattanooga, Everest McDade and Wm. Taylor, Jr., accompanied me. McDade's camera and a stout rope were also with us.

We drove over the mountain and into Sequatchie Valley and finally arrived at our usual parking place. We shouldered the luggage and were soon making our way up the mountain on the east bank of Chitty's Creek. In

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the fall one may scramble over the rocks in the bed of the creek, but not in the spring. We followed a path which was apparent most of the way and which ascended the rather steep bank. We reached some elevation above the creek and after about thirty minutes knew that soon we must descend or miss the huge beech tree whose roots are in the creek, and whose trunk bears the date 1878, which is our guide to the Sink. Suddenly we realized that the roar of water was greater than a minute before and we looked across, through some of the trees and over others and beheld a snowy, rushing mass. It was the falls that cascade so beautifully over a series of ledges into the sink, finally reaching its floor where two cracks receive the watery bounty. We hurried down the bank to the creek, crossed it by jumping from rock to rock, and scrambled up the short but steep grade on the west side to the rim of the sink. What a sight! A great hole, 30 by 50 feet at the actual brink or 40 by 60 at a higher level which earlier visitors must have considered the true rim. We climbed around to the north side, and holding to a stout rope tied to a tree to avoid slipping in the soft muddy soil, made our way down the steep slope to the north brink. I aimed at twin trees growing at the very edge and sat down astride them, my feet hanging over the edge, partly supported by bushes. As soon as I could adjust my field glasses, I began to search for plants of Scolopendrium and was rewarded. Almost at once I was certain of one plant.

The top of the sink, from this point, is readily seen to be triangular, the east and west walls converging toward the south. On the north side there is a sheer drop of thirty-five feet, from where I sat to the bottom. The distance from this rim to the upper one is fifty-five feet, the total ninety feet, which is the figure given by Dr. Maxon (7). From the north-west the water cascades,

spray from it almost filling the cavity. As the cool misty air met the warm air above, a light fog arose, and until my own spectacles became adjusted to the situation, a film formed and reformed on them. Finally my lenses remained clear and I began to appreciate the place as never before. On my other trips I had to be satisfied with what could be seen in the reduced light of late afternoon in fall, and now it was noon and spring. Just about twelve o'clock and until a little after one, the sink received direct rays from the sun. The wealth of large trees that are growing on the slope between upper and lower rims keep the hole dimly lighted except when the sun is directly over it. On the wall of the sink that is nearest the creek (which is the east wall, facing west), there are two ledges, one some fifteen feet from the top and the other twenty feet below the first. On the upper ledge, near its south end, is the plant I had located. Taylor went down to this ledge *via* an old steel cable and soon located a much larger plant than the first, growing close to the perpendicular wall and near the north end. This plant had been seen on each of my other trips made in September, 1933, and October, 1934. The removal of several plants of stinging nettle gave a splendid view of the fern and several pictures were made.

The boys then decided to descend to the bottom, another twenty feet down the cable, the kodak and tripod being lowered by means of the rope. By this time I had located a plant on the lower ledge which is partly under the upper one, hence only part of this plant was visible from the top. It proved to be the largest one of all, some of the fronds about a foot long. It was photographed also. On the opposite side (wall which faces east) is a ledge about on a level with the lower one jutting from the east. This was found to contain a large plant near its north end and two smaller ones toward the south, a total of six adult plants on all ledges.

In the Sink at South Pittsburg, Tennessee. A frond of Hart's tongue may be seen a little below and to the left of the center of the picture.

In 1900, shortly after his visit to the sink, Dr. Wm. R. Maxon wrote the following as part of his article published in the Plant World on "The Hart's-tongue in New York and Tennessee" (7). In describing the sink, he said—"Its walls are perpendicular and without foothold on two sides, and on the other two retreat to form a cave which extends beneath the cliffs." The opening of this cave is prominent at the south-east corner of the sink. The upper edge of the opening is about twenty feet from the top of the sink and extends toward the north under the upper ledge. Dr. Maxon said further—"Across and above to the right (north-west corner of sink) is the miniature cascade. A few of the ferns are there on the wet cliffs, almost within the spray but the great majority —more than a hundred, I think—are at our feet on the leveler, clayey floor under the partial shelter of the projecting ledge. The soil is a light colored, rather loose clay which becomes extremely sticky upon moistening. What a difference from the black leaf molds of our northern woods!"

At present and for several years past, this floor has been a bit different. From the floor of the cave (south-east) to the cracks through which the water disappears, there is a rather steep slope. Much of it is bare, the surface having a dark slaty appearance, sticky when moist. Part of it is green, probably algal growth, and the rest, a bed about fifteen feet long by half as wide, is covered by a dense growth of moss and liverwort. A close examination of this disclosed a number of tiny Hart's-tongue plants, their fronds averaging not more than an inch in length. During the summer A. J. Sharp visited the sink, counted the tiny plants, and sent me word that there are twenty in and near the bed of liverworts.

Great was our excitement! We had come, hoping to be

able to report that the ferns were holding their own, and we found ourselves possessed of the news that the Hart's-tongue in Tennessee is increasing.

HISTORY

About 1878, the territory south-west of South Pittsburg, where the Hart's-tongue in Tennessee is located, was prospected for mines. In fact Major Cheatem, an engineer, combed the region in search of new mines. In 1879 he wrote to Mr. John Williamson, of Louisville, Kentucky, sending him specimens of the ferns for identification, together with a description of the place. He recognized the plants as ferns and called them "deer-tongues."

In 1890 or thereabouts, the family of Mr. Joseph Lodge, of South Pittsburg, English people who were familiar with the Hart's-tongue in their homeland, learned of its presence in the vicinity. Mr. R. H. Middleton, also an Englishman, who sold insurance in South Pittsburg at that time, had previously learned about the fern. When Mr. R. L. Lodge, son of Joseph, and still a resident of South Pittsburg, was a small boy he remembers taking trips with Mr. Middleton and thus becoming acquainted with the fern. In a recent letter Mr. Lodge says—"Mr. Middleton told me of this fern and showed me a specimen that he said was growing near the top and that he had been able to get with his walking cane." The entire Lodge family, we might say, adopted the fern and has been most zealous of its welfare ever since. It is altogether possible that without their interest the sink might no longer harbor these rare plants.[1] In 1898, Mr. and Mrs. Joseph Lodge estimated 200 plants in the Sink.

---

[1] Note.—People in this section are curious about unusual plants. By keeping very quiet about the ferns, the Lodges have prevented their demise. Therefore, when you visit the ferns, depend only upon these friends for direction.

When Dr. Maxon and Mr. Pollard from the Smithsonian Institution visited there in August, 1900, with R. L. Lodge, then a young boy, as guide, they too were impressed with the large number of plants. Dr. Maxon gave 110 as the number he believed to be there then.

When Dr. Elisha Lee, for many years the leading physician in Bridgeport, Alabama, was a young man, he became interested in botanical collections made by his daughters as part of their school work. He was especially interested in ferns and began to collect them. Mrs. Lee was a daughter of Russel Bean, and a great granddaughter of William Bean, first settler of Tennessee. The land on which the Sink is located belonged to the Bean family for several generations. From them the Portland Cement Co. at Richard City, purchased it about 1908.

Some time after his marriage into the Bean family, Dr. Lee became acquainted with the strange plant in the Sink. He recognized it as a fern but did not know its correct name. It had come to be known as the "Bean Fern" and this name persisted until the visit of Dr. Maxon and Mr. Pollard in 1900. Dr. Lee was interested in exchanging as well as collecting ferns. He built up a splendid collection from all parts of the world. On the thirtieth of November (1934) Mrs. Fred. Porter and I made the trip to Bridgeport and visited with Dr. Lee for about two hours. We were greatly inspired. Dr. Lee was then nearly ninety-six years old. He was very deaf, and saw poorly, but his mind was quite clear and he enjoyed talking with us about the Hart's-tongue. Dr. Lee told us that he had collected ferns from the Sink several times. The first time he wished some, he bargained with a small neighborhood boy, "who could climb anything," to go into the Sink. The next time he wished some he went down himself *via* a tree and a rope. He recalled the trip vividly and chuckled as he told us about

it. (Dr. Maxon also has a vivid recollection of his trip into the Sink. Not long ago he mentioned it. The pulley broke, and he will never forget being hauled out "like so much coal.") Dr. Lee's daughter, Mrs. Freeman, had unearthed her father's ferns for our inspection. We looked through all in the hope of finding specimens of the Hart's-tongue from Tennessee, but to no avail. He had exchanged many with other collectors and evidently expected to make another trip for ferns for himself. There are no less than a dozen fine fronds from the station at Jamesville, New York, so there should be a considerable number from Tennessee somewhere in New York. Though unmounted, his ferns were in a pleasing state of preservation. We expressed the hope that his collection may sometime become a part of some public herbarium. We learned later that it is his desire, that, preferably, some Southern college will purchase and take care of it.

The Hart's-tongue plants had decreased greatly by 1911, for, in that year, Mr. Graves visited them, and could count only 58 in September.

About 1915, Dr. Lee made his last visit to the ferns and he said, "There were very few."

In 1925, Mr. R. L. Lodge reported to Dr. Maxon, "Only a few ferns left."

In 1930, Mr. Graves reported only six plants there in 1929, and decided that in a few years there would be no Hart's-tongue growing at the Southern station (5). In June, 1935, Mr. Graves wrote me that he was much interested in my report of the station and especially in the location of the plants there. He told me that in 1929 he had carried with him spores from a plant growing in his garden which had originally come from Owen Sound, Ontario. These he sowed on the top of the south slope and toward the south-west. He felt sure there were no plants on the upper shelf at that date. He said that at

that time the south slope had caved in. The cave-in occurred, then, sometime between 1911 and 1929.

In 1931 Mr. Anderson suggested that it seems likely that the ferns will disappear from the Tennessee station (1).

In the fall of 1933 and of 1934, this indeed seemed likely. In 1933 we saw five plants and in 1934 could be certain of only two, and these on the upper shelf. Both of these visits were made in late afternoon, however, and parts of the Sink were quite dark.

It is with great pleasure that we report at least twenty-six plants flourishing in the year 1935. We must add, though, that probably only the four adult plants on the lower shelves are from the original stock, while the twenty infants are no doubt from spores, (mentioned above) and at least the large plant on the upper shelf has likely been planted there since 1929.

No one knows what became of the lost plants. A few were carried out, some met a natural death there, but most of them must have met their fate when the south slope caved in. The change in the contour of the south end of the Sink has been considerable, and there have been heavy rains, near floods, that could easily have loosened the fern mass and precipitated it into oblivion.

Before our 1935 trip to the sink, I was somewhat disturbed over the suggestion that changes in the edaphic conditions of the place were responsible for the gradual death of the plants, that, for example, the temperature and humidity were possibly no longer favorable or the light insufficient. If such had been the case, the station would soon have become extinct.

At this time, it is impossible to know certainly whether or not the return of the ferns is due to the introduced spores, but I believe we can state that "favorable conditions are still with us." To the writer, the latter is the

most interesting and important statement in the paper. The ferns are flourishing and from all appearances will continue to do so.

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UNIVERSITY OF CHATTANOOGA,
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The Hart's-Tongue Fern in Maryland

ARTHUR N. LEEDS

On August 2nd, 1932, Samuel Mason, Jr., of Darlington, Maryland, wrote me that he had discovered the hart's-tongue fern growing in a ram-pit on a near-by farm. He illustrated his letter with an outline drawing of the tip of a frond, which left no doubt as to the identity of his find.

Seven weeks later, he took me to see it. The ram-pit—a stone-lined well about five feet deep with a hydraulic ram in the water at the bottom—was in the valley of a little stream a few yards to one side of the stream itself

THE HART'S-TONGUE AT DARLINGTON, MARYLAND. THE RAM-PIT IS IN THE FORE-GROUND, A LITTLE TO THE LEFT OF THE CENTER.

at the base of a hill on which the farmhouse stood. The pit was covered with loose boards, so that it was well shaded within but not entirely dark, and the flowing spring water no doubt kept its temperature in hot weather well below that of the outside air. On the walls of the pit the hart's-tongue was growing in abundance and luxuriantly. Some of the rosettes were eighteen inches across with forked fronds here and there. There was some other vegetation along with them, but the fern predominated. Evidently it had found a congenial home similar to the sort of place in which it sometimes grows in England. One is reminded of Thomas Hardy's description in "Jude the Obscure" of the deep well "with the lining of green moss near the top, and nearer still the hart's-tongue fern," to which R. C. Benedict[1] lately drew attention.

Since 1932 it has been kept under observation; a number of botanists have gone to look at it—Dr. R. R. Tatnall, of Wilmington, and Dr. E. T. Wherry among them; and, at last report (summer, 1935) it was still flourishing.

Fernald[2] has recently shown that the very rare American hart's-tongue differs sufficiently from the widely spread foreign species to justify its being given varietal status, and, on reexamining these Maryland specimens in the light of his analysis, it is clear that they are *Phyllitis scolopendrium* (L.) Newm. and not its var. *americana* Fernald.

Apparently we have to do with the chance establishment of the occasionally cultivated foreign hart's-tongue; but how did it get there? The most obvious guess was that it might have originated from plants cultivated in the house. Investigation, however, put that out of the question. Mr. C. B. Bragdon, the owner of the farm, had

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[1] AM. FERN JOURNAL **23**: 63. 1933.

[2] Rhodora **37**: 220. 1935.

Hart's-tongue in the ram-pit at Darlington, Maryland.

only recently acquired the property and had not noticed the fern's presence until Mr. Mason called his attention to it. We hunted up the previous occupants, who had lived on the place for twelve years. They were aware of it; had, indeed, taken some of it up and tried unsuccessfully to raise it in the house; but did not realize that it was of any particular interest. They thought it had been growing in the pit for at least seven years before they left, but that it was not there when they came to the farm. Further inquiry led us to the family who had preceded them in the ownership of the property and who also were still living not far away. Their memory went on back for over thirty years more, and the alert old lady, who had been the mother in the home, was quite definite in her statement that she had never seen it in the pit and had not cultivated it in the house or garden. In fact, she said, they had had very few flowers and those of only the ordinary kinds.

It seems, therefore, that the fern has been well established in its present secluded "hide-out" for the last twelve years or so and that it had not spread from plants cultivated on the place. Baltimore is twenty-seven miles away and Washington forty-five. In the latter city it has been grown out of doors in a rock garden. Perhaps the spores drifted in from one of these cities.

The sporadic occurrence of plants in places remote from their range is an occasional, but well known, phenomenon. Old wells, the damp, shaded walls of locks on abandoned canals, and similar places furnish every now and then a surprise for the collector. Thus, J. E. Benedict, Jr.,[3] found *Adiantum capillus-veneris* on a stone wall around a spring in Montgomery County, Maryland, far to the north of its natural range; and nearly forty years ago C. F. Saunders[4] was astonished to discover *Phegopteris*

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[3] AM. FERN JOURNAL **14**: 21. 1924.

[4] Proc. Acad. Nat. Sci. Phila. **52**: 548. 1900.

dryopteris growing in the shaft of an old well at Calico in the heart of the pine barrens of New Jersey more than a hundred miles away from its typical cool mountain home.

THE ACADEMY OF NATURAL SCIENCES
OF PHILADELPHIA.

Fern Field Notes, 1936

EDGAR T. WHERRY[1]

TWO CALCAREOUS-SOIL FERNS IN LOWER SOUTH CAROLINA.—In listing the ferns of the coast region of South Carolina, Miss Bragg[2] included *Dryopteris patens* as collected by Ravenel at Eutaw Springs and by herself as an escape at Otranto. The plant concerned is what was subsequently segregated by Christensen as *D. normalis*. On July 6, 1936, Mr. J. E. Benedict, Jr., and I explored the bluff on the west side of Biggin Swamp, through which the old Santee Canal runs, about 2 miles northeast of Moncks Corner. Here an outcrop of Cooper Marl yields an abundance of calcareous soil, and this fern occurs in great luxuriance and profusion, forming an especially beautiful display near the Cooper River. On a hard marl ledge there were also found several plants of *Asplenium resiliens*, which was not listed by Miss Bragg (though possibly represented by the Bachman report of *A. trichomanes*).

WOODSIA ILVENSIS REDISCOVERED IN NORTH CAROLINA.—Among the notable plants observed in the vicinity of Jefferson, Ashe County, North Carolina, in 1841, Asa Gray[3]

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[1] Contribution from the Botanical Laboratory and Morris Arboretum of the University of Pennsylvania.

[2] This JOURNAL 4: 92. 1914.

[3] Am. J. Sci. 24: 27. 1842; Sci. Papers Asa Gray 2: 49. 1889.

listed *Woodsia ilvensis*, without, however, giving any definite locality for it. Being unable to find any specimens preserved, I expressed doubt as to the occurrence of the species in the State in my Fern Field Notes for 1933.[4] Subsequently, however, Mr. Weatherby advised me that one of the fronds on a mixed sheet in the Gray Herbarium is ascribed to North Carolina. On July 14 Mr. Benedict and I followed the more or less distinct trail southward from Jefferson up Nigger Mountain. Our first find consisted of *Lycopodium selago* (which Gray had found on Phoenix Mountain) in a vertical crevice close to the trail. For a long time our search of the rock ledges was otherwise fruitless, but by a fortunate chance we worked westward from the trail between the two levels where extensive rocky flats are developed; and here on a gentle northwest slope, with scattered shrubs forming some shelter, we came on a colony comprising about 10 clumps of the *Woodsia* sought. Whether this represents the occurrence found by Gray 95 years previously is questionable, but at any rate the species can now be correctly included in the list of North Carolina ferns.

Other southern records of *Woodsia ilvensis* deserve brief discussion. Because of its inclusion by Williamson[5] many compilers of data ascribe it to Kentucky, overlooking that author's admission that "I have not been able definitely to give this beautiful little fern 'a local habitation and a place' in Kentucky." In reporting it in West Virginia[6] I made an error in the county; the locality, 2 miles southwest of Landes, is not in Pendleton as previously stated, but about $\frac{1}{4}$ mile within Grant County. Unfortunately this place has been visited in recent years by overzealous collectors, who have removed the fern

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[4] This JOURNAL 23: 112. 1933.

[5] Ferns of Ky.: 115. 1878.

[6] This JOURNAL 13: 108. 1923.

completely. At least 7 stations in Virginia are now known, in the following counties: Augusta, 2; Giles, 1; Page, 3; and Shenandoah, 1.

AN INTERMEDIATE BEECH-FERN IN MACON COUNTY, NORTH CAROLINA.—Our two eastern beech-ferns are often termed respectively the "long" and the "broad" beech-ferns, but as they do not differ in outline as consistently as these adjectives imply, I prefer to term *Dryopteris Phegopteris* (*Phegopteris polypodioides*) the northern, and *D. hexagonoptera* the southern beech-fern. At the time Dr. Blomquist[7] was compiling his Ferns of North Carolina, he showed specimens from the Dry Falls of the Cullasaja, 3 miles west of Highlands, Macon Co., N. C., to Dr. Maxon and myself, and on our recommendation included it as a scaly form of the southern beech-fern. On August 30th of the present year I visited the place, and found all the plants there (Plate 15, fig. 1) to show one of the diagnostic features of the northern species, namely absence of wing on the rachis between the lowest and the second pair of pinnae. Although not so hairy as usual for the northern plant, the laminas do bear some broad brown scales on the under side, so I now think that the occurrence should be regarded as a southern range-extension of the northern beech-fern. Evidently it is enabled to grow this far south by the continuous current of cool air produced by the waterfall behind which it grows.

A REMARKABLE FERN-ASSOCIATION ON AVERY ISLAND, LOUISIANA.—On September 9, 1936, a visit was made to Avery Island, in Iberia Parish, on the coast of Louisiana, under the guidance of Mrs. Dan Debaillon. In the steep-walled ravines grow several species of ferns, including *Adiantum pedatum*, not previously reported this far

[7] Ferns of N. C.: 72. 1934.

south. At one point were seen several plants of *Pteris cretica*, presumably an escape from a greenhouse of some nearby estate. Alongside of one clump of this subtropical species there was found most unexpectedly a small plant of the decidedly northern "narrow-leaf spleenwort" or glade-fern, *Athyrium pycnocarpon*. The southernmost station of this fern previously known is in West Feliciana Parish, 75 miles away; its ability to survive at this still more southern point is evidently due to the ravine being very narrow, completely shaded from the sun, and well cooled by air currents. A photograph showing the two ferns of such divergent geographic relationship growing side-by-side is reproduced as Plate 15, figure 2.

PHILADELPHIA, PA.

A List of Varieties and Forms of the Ferns of Eastern North America

C. A. WEATHERBY

(*Continued from Page 99*)

ATHYRIUM THELYPTEROIDES (Michaux) Desvaux, Mémoires Société Linnéenne Paris **6**: 266 (1927). *Asplenium t.* Michaux, Flora Boreali-Americana **2**: 265 (1803).—Segments broadly oblong or somewhat ovate, cut squarely off or broadly rounded at apex, the sides nearly parallel, entire or only slightly toothed.

F. ACROSTICHOIDES (Swartz) Gilbert, List North American Pteridophytes 15 (1901). *Asplenium a.* Swartz, Schrader's Journal für Botanik for 1800, part **2**: 54 (1801).—Segments ovate, narrowly oblong or linear-oblong, tapering more or less to a narrowly rounded or somewhat acute tip, usually more or less toothed.

Though connected by numerous intermediates, these two forms are more or less readily distinguishable. Gilbert separated them, rather vaguely, in the Fern Bulletin

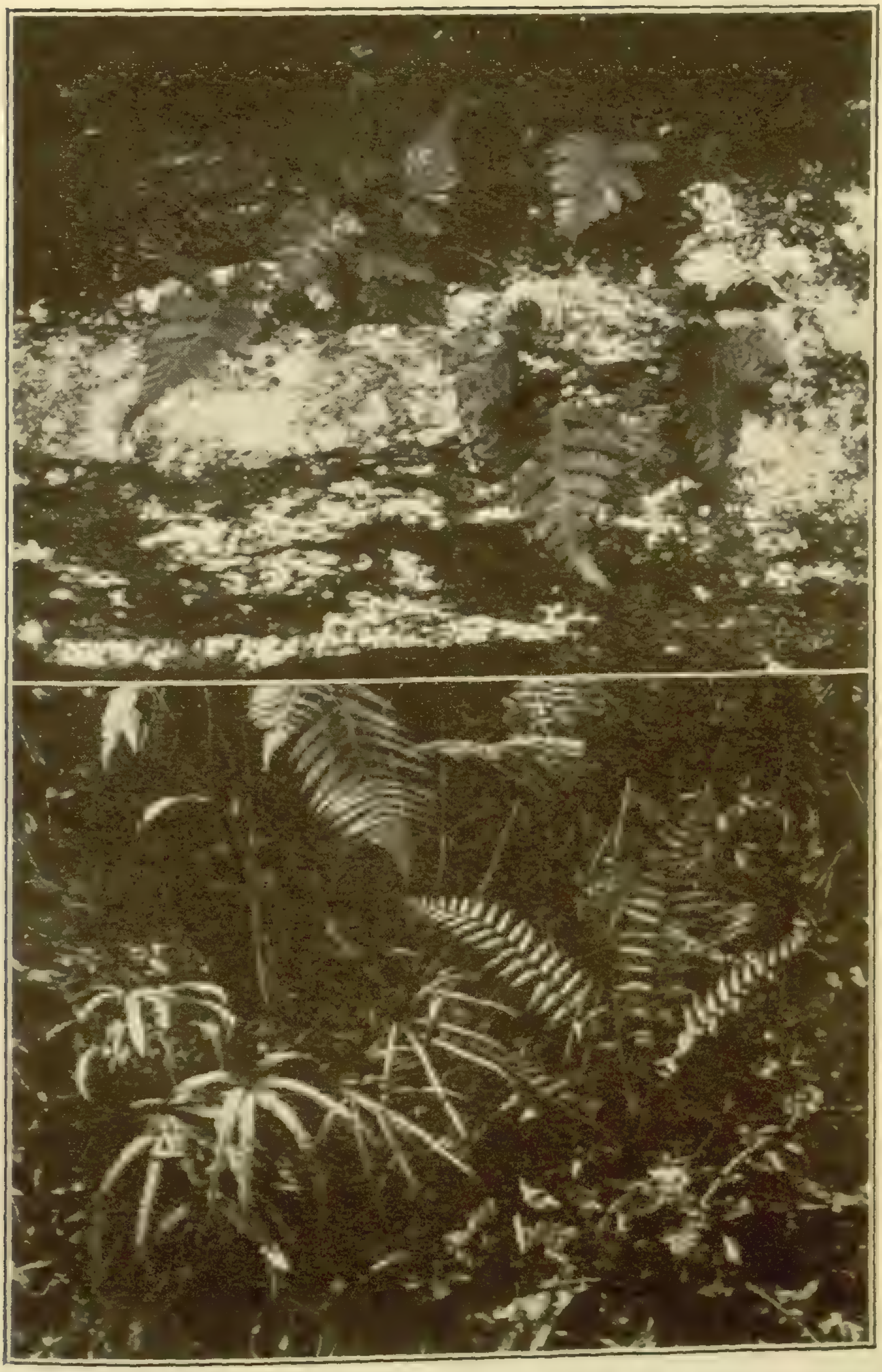

FIG. 1 (UPPER).—NORTHERN BEECH-FERN AT ITS SOUTHERNMOST KNOWN STATION, DRY FALLS, MACON CO., NORTH CAROLINA.

FIG. 2 (LOWER).—THE SUB-TROPICAL PTERIS CRETICA GROWING BESIDE THE NORTHERN GLADE-FERN, ATHYRIUM PYCNOCARPON, ON AVERY ISLAND, LOUISIANA.

8: 9 (1900), but confused his definition by endeavoring to use the presence or absence of hook-shaped sori as a distinguishing character—a purpose for which it is worthless, as pointed out by Winslow in this JOURNAL **1**: 82 (1911). Gilbert also, as seems reasonably sure from the original descriptions, exactly reversed the proper application of the names of Michaux and Swartz.

Present rules of nomenclature require the use of Michaux's name, though the later, for the species; since Gilbert's name for his form was based on that of Swartz, it may be used for the latter's plant. *Asplenium thelypteroides* β *serratum* Lawson, Edinburgh New Philosophical Journal, series 2, **7**: 115 (reprint 15) (1864), is the extreme of forma *acrostichoides* with conspicuously and deeply serrate segments.

ATHYRIUM FILIX-FEMINA (Linnaeus) Roth, Roemer's Archiv für die Botanik **2**, part 1: 106 (1799). *Polypodium F.-f.* Linnaeus, Species Plantarum 1090 (1753).—Rootstock erect; fronds forming a crown with the new growth in the center; blade tapering about equally both ways from the center, the lower pinnae much reduced and far apart; largest indusia mostly less than 1 mm. long and more than half as broad, fringed with relatively long, non-glandular cilia; spores yellow, somewhat warty.—Eurasia and western North America; Gaspé Peninsula and Newfoundland.

The east-American plant apparently belongs to var. SITCHENSE Ruprecht ex Moore, Index Filicum 183 (1860), a large and stout strain of rather thick texture, with the ultimate divisions only shallowly toothed.

ATHYRIUM ANGUSTUM (Willdenow) Presl, Reliquiae Haenkeanae **1**: 39 (1825). *Aspidium a.* Willdenow, Species Plantarum **5**: 277 (1810).—Rootstock horizontal or oblique, the fronds loosely clustered, the new growth in front of the old; blades commonly less reduced below; largest indusia mostly more than 1 mm. long and less than half as wide, mostly toothed or short-ciliate; spores yel-

low, nearly smooth. Fronds dimorphic, the fertile contracted and leathery in texture, the sori at maturity covering the lower surface of the obtuse, only shallowly toothed or lobed pinnules.—Quebec to Winnipeg, south to Pennsylvania and Ohio.

Var. ELATIUS (Link) Butters, Rhodora **19**: 191 (1917). *Asplenium e.* Link, Filicum Species in Horto. . . . Berolinense 94 (1841).—As in typical *A. angustum,* but the pinnules acute, strongly toothed or lobed.—Southern Quebec to Maryland, Minnesota and Missouri.

F. cristatum (Hopkins) Broun, ms., n. comb. *Athyrium angustum* var. *c.* Hopkins, AMERICAN FERN JOURNAL **9**: 88 (1919).—Tips of blade and pinnae crested.

Var. LAURENTIANUM Butters, *op. cit.* 194.—Fertile and sterile fronds alike, the sori separate at maturity; pinnules obtuse, set nearly at right angles to the rachis of the pinna, diminishing in size regularly toward the tip of the pinna, obscurely but regularly toothed, connected by a broad wing along the rachis.—Labrador to Maine.

Var. RUBELLUM (Gilbert) Butters, *op. cit.* 193. *Athyrium Filix-femina* var. *r.* Gilbert, List North American Pteridophytes 35 (1901).—Similar to the preceding, but the pinnules somewhat acute, strongly toothed or pinnatifid, wing along the rachis narrow or none.—Newfoundland to Pennsylvania, South Dakota and Missouri.

F. CONFERTUM Butters, *op. cit.* 195.—Pinnules varying irregularly in size, irregularly toothed or lobed, broadly oblong, the lobes wide and overlapping.

F. LACINIATUM Butters *l. c.*—Pinnules very irregular in shape, with long, sharp teeth which project in various directions.

F. ELEGANS (Gilbert) Butters, *l. c. Athyrium Filix-femina* var. *e.* Gilbert, List North American Pteridophytes 33 (1901).—Pinnules oblique to the rachis of the pinna, decurrent on it at their inner bases, their teeth acute.

ATHYRIUM ASPLENIOIDES (Michaux) Desvaux, Mémoires Société Linnéenne Paris **6**: 266 (1827). *Nephrodium a.* Michaux, Flora Boreali-Americana **2**: 268 (1803).—Rootstock and frond-growth essentially as in *A. angustum,* the former not densely covered with old frond-bases; blade broadest near base, the lower pinnae

not, or but little reduced in size; pinnules oblong to oblong-linear, only shallowly lobed; young indusium glandular-ciliate; spores with a blackish, wrinkled outer coat.—Eastern Massachusetts to Indiana and Missouri, south to the Gulf States.

F. SUBTRIPINNATUM Butters, Rhodora **19**: 189 (1917). —Pinnules triangular-lanceolate, cut into oblong-obtuse lobes.

The above is essentially Professor Butters's treatment of the lady-ferns; it defines, conservatively and as well as seems possible, the main lines of variation in a bewilderingly polymorphic group. But his three species are very closely related, often much alike in general aspect and not always easy to distinguish. The two of eastern North America are comparatively readily recognizable in the north and in the south where each is the exclusive occupant of its area; but in the region from southern New England to about the Potomac valley, where both occur, they intergrade freely and in most perplexing fashion. All three would perhaps be better treated as geographic varieties of a single species, roughly analogous to those of *Cystopteris fragilis.*

Of Butters's varieties, typical *Athyrium angustum* and var. *rubellum*[1] are, as he has pointed out, responses to environmental conditions, the former occurring in comparatively dry and sunny surroundings, the latter in moist, shady woodlands and in the cool and moist regions of the north. Var. *elatius* is, so far as my own observation goes, less dependent on circumstances and perhaps better deserves the status of variety. Var. *laurentianum* appears to be a juvenile state which, under the comparatively adverse conditions of the North, persists through

[1] Although Gilbert founded and named his variety on the occurrence of red stipes and rachises in his original plants, the presence of coloration is not an important character and may or may not happen in any of the forms.

the maturity of the plant. Forma *elegans* is of very distinctive appearance, so much so that Gilbert regarded it as almost a species; but it possesses no other characters than those of leaf-form and seems to have no distinctive range.

The ranges here given are based on specimens actually seen by me; very likely some of the varieties may be found outside the limits stated.

Athyrium Filix-femina δ *rigidum* Lawson, Edinburgh New Philosophical Journal, new series, **7**: 115 (reprint 16) (1864), might well be, from the description, the same as var. *laurentianum*, but without authentic material (and it seems probable that none now exists) I should not displace Butters's well attested name.

In AMERICAN FERN JOURNAL **8**: 82 (1918), Dr. O. E. Jennings proposed two new varieties of *Athyrium angustum*, var. *glandulosum* and var. *boreale*. The former was described as differing from var. *rubellum* in rather more acute and somewhat spinulose-toothed pinnules, long-ciliate indusia and the presence of glands on the stalks of the sporangia. The last two conditions were observed in occasional individuals and discussed by Butters. In themselves they are hardly sufficient to constitute a variety, and the difference in cutting of pinnules is, by definition, slight and comparative, and is only dubiously to be associated with the other characters. Nothing would seem to be gained by attempting to maintain this segregate. Var. *boreale* appears to be what I understand as var. *elatius*.

Athyrium Filix-femina forma *plano-rhaeticum* and f. *rectangulare* Gilbert, List 34 and 35, I cannot place from their descriptions. Various other names, drawn from European authors, have been applied to east-American forms, but since they were based on Old World material they cannot properly be used for our plants.

ATHYRIUM ALPESTRE (Hoppe) Rylands ex Moore, Ferns Great Britain and Ireland Nature-printed, folio edition, under Plate 7 (1857). *Aspidium a.* Hoppe, Neues botanisches Taschenbuch for 1805: 126.—Blades bipinnate or somewhat bipinnate-pinnatifid; ultimate lobes oblong, approximate; sori nearer the midrib.—Eurasia; also in western Newfoundland.

Var. GASPENSE Fernald, Rhodora **30**: 48 (1928).—Blades from bipinnate-pinnatifid to nearly four-pinnate; ultimate lobes linear or linear-lanceolate, not close together; sori mostly nearer the margin. Differs from the western var. *americanum* Butters in its proportionately broader and more finely cut blade.—In the mountains of the Gaspé Peninsula, Quebec.

(To be continued).

GRAY HERBARIUM.

Adventures in Fern Collecting. II.

ERNEST J. PALMER

In the summer of 1908 Mr. B. F. Bush and the writer spent several days collecting plants in the vicinity of Noel, near the southwest corner of Missouri. On August 9th we were exploring a high cliff along a little stream called Butler Creek when we came upon a pretty and interesting little fern growing in the crevices of the limestone that proved to be *Cheilanthes alabamensis,* a species not previously known from the state, and one of the southern ferns that barely gets into the range of Gray's Manual.

The village of Noel is located on the Elk River, a small tributary of the Neosho River, which it joins in Oklahoma, and through which its waters find their way into the Arkansas River and ultimately into the Mississippi and the Gulf of Mexico. The direction of the drainage in this section may account for the presence here of a number of southern and southwestern plants

not found in other parts of the state. The region is typical of the western slopes of the Ozark plateau, with rugged uplands covered with a growth of oak-hickory forest and with a sprinkling of yellow pine (*Pinus echinata*) on the higher ridges. The streams are swift-flowing and with narrow valleys, usually bounded by high perpendicular bluffs cut through the horizontal beds of Lower Carboniferous limestone which underlies most of the area.

Butler Creek, which joins the Elk River at Noel, has its source in a group of mineral springs at Sulphur Springs, just south of the Arkansas boundary, and about a mile north of the state line there is a high cliff, known as Butler Bluff, where *Cheilanthes alabamensis* was found. At the highest point the cliff is perhaps 60 or 70 feet high, and the exposure is to the west or southwest. Below the perpendicular face a talus slope extending for several yards to the creek valley is covered with a dense tangle of vegetation, and there are several outstanding ledges at different levels along the cliff, upon which a variety of shrubs and herbaceous plants are established. We were following our way carefully along one of these ledges, which gradually diminishes from a width of several feet at the southern end until it disappears several yards farther down the cliff, when we came upon the little fern growing in partial shade in crevices of the rock. It is very local and comparatively rare here, but more abundant a few miles farther south across the Arkansas boundary.

Cissus incisa, a fleshy-leaved vine of the Southwest, was also found growing along the exposed face and ledges of Butler Bluff on the same day, and this was the first record for it in Missouri. Other characteristic xerophytic plants found along the ledge were *Commelina crispa*, *Mentzelia oligosperma*, and *Helianthus hirsutus*,

and along the top of the bluff *Juniperus virginiana*, *Celtis laevigata*, *Vaccinium arboreum*, *Andropogon Torreyanus*, and *Triodia elongata* were collected. A number of other ferns were found growing along the bluff at different levels and in various degrees of shade. The species noted or collected were *Cheilanthes Feei*, *Nothoolaena dealbata*, *Pellaea atropurpurea*, *Asplenium platyneuron*, *A. resiliens*, *Cystopteris fragilis*, *C. bulbifera*, *Woodsia obtusa*, *Camptosorus rhizophyllus*, and *Adiantum pedatum*, and along a dripping ledge at the south end there is a colony of *Adiantum Capillus-Veneris*.

A year or two later Mr. Bush found a second locality in Missouri for *Cheilanthes alabamensis*, while collecting along the bluffs of White River, near Branson, Taney County. It is interesting to note that the rare *Cissus incisa* was growing with it at this station also. I have just learned that both plants have been found during the present season at another locality in the same part of the state by Dr. Steyermark.

Asplenium ebenoides, a hybrid between the Ebony Spleenwort and the Walking Leaf fern, is one of the rarest ferns of the Manual range, and only twice has it been my good fortune to find it. The first occasion was in the spring of 1919, while engaged in making a botanical survey of several counties in southern Illinois. On April 22nd, after exploring an interesting Cypress and Tupelo swamp along the Mississippi River and near the village of McClure, Alexander County, I followed a ravine until it led up into a rocky wooded hillside. A number of ferns were seen here at different levels. *Asplenium angustifolium* was growing near the edge of the swamp, and higher up on the ledges and bowlders of limestone and chert I collected *Cheilanthes lanosa*, *Pellaea atropurpurea*, *Asplenium Trichomanes*, *Asplenium platyneuron*, and *Camptosorus rhizophyllus*, and

lastly after some searching and to my great delight, a number of plants of *Asplenium ebenoides* were found on a partially shaded ledge closely intermingled with the last two species.

It was not until 1927 that I again found a little colony of this interesting fern. This was in Ozark County, Missouri, near the post office of Tecumseh, on the North Fork of White River. Just above the river bluffs many large residual bowlders of chert and dolomite were scattered through the open woods. Many small plants were growing on the bowlders, especially on the mossy north exposures and in the protection of clefts and seams. The following ferns were collected here in a small area: *Woodsia obtusa, Cystopteris bulbifera, Asplenium Trichomanes, Asplenium Bradleyi, Asplenium platyneuron,* and *Camptosorus rhizophyllus.* Noticing that the last two were growing in close proximity to each other here, it occurred to me that it would be a good place to look for the hybrid, which I had never found in Missouri before, and after carefully examining a number of bowlders I was rewarded by finding two or three little plants of *Asplenium ebenoides,* the fronds of which showed a series of gradations between the entire ones of the Walking Leaf and the completely pinnate ones of the Ebony Spleenwort.

ARNOLD ARBORETUM

Shorter Notes

HART'S-TONGUE FERN TRANSPLANTS.—While the idea of saving native plants from destruction is an excellent one, the moving of species to long distances from their native haunts seems likely to confuse the plant geographers of the future. Dr. House[1] has recently urged that records

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[1] This JOURNAL 25: 137. 1935.

of plantings of the Hart's-tongue fern be filed with the Secretary of the American Fern Society, indeed a desirable plan. Unfortunately, however, the transplantation of this species—both European and American varieties—has now been going on so long that the collecting of complete data seems too much to expect. We must strive to collect as many such records as practicable, but in their absence the following considerations should guide fern students in the future:

No herbarium record of *Phyllitis Scolopendrium* from other than a well-known locality of date subsequent to 1920 (when active transplantation seems to have begun) should be considered valid without field examination of the occurrence.

If such field examination shows (a) the habitat to be other than that typical of the American variety (var. *americana* Fernald)—namely cool, sheltered limestone ledges or talus; (b) only a few (1 to 4) plants to constitute the colony; or (c) only the European variety to be represented, or both European and American varieties to be growing side by side; then the occurrence is to be regarded as presumptively an introduction, and not reported as adding to the list of known stations of the fern.

In view of the presence of but two plants, the find of this species by Dr. Stebbins[2] in Madison Co., New York, is in my opinion an obvious transplant. Reports which have come to me privately of the finding of this species in both Illinois and Iowa have again involved but 2 or 3 plants, and I would interpret them in like manner.

Most important of all from the plant geographical standpoint, the finding of the European variety in American localities should not be regarded as invalidating their classification as distinct.—EDGAR T. WHERRY.

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[2] This JOURNAL 25: 106. 1935

WELL CURBS AS FERN GARDENS.—Mr. Leeds' report of the Hart's-tongue fern found growing luxuriantly on a well curb in Maryland recalls finding semi-hardy ferns on a well curb about thirty years ago near Orange, New Jersey. At that time, specimens of the Asiatic holly fern, *Cyrtomium*, and of the cultivated Pterises, were reported apparently as having lived through at least one winter. For some time I have been entertaining the thought of trying this kind of culture by making a small dry well with a depression two or three feet deep, a few feet across, and lined with loose stones.

It seems reasonably certain that if, in such a well, a certain amount of limestone is used, conditions favorable for the Hart's-tongue could be established. Possibly also some of the semi-hardy Old-World ferns might receive sufficient protection for their successful wintering. Perhaps some one who reads this has already tried such a well. If so, a report of results would be of interest.—R. C. BENEDICT.

TRICHOMANES PETERSII AT SARATOGA, MISSISSIPPI.—On September 5, 1936, I drove to Saratoga station, Simpson County, Mississippi, to try to rediscover the locality from which this fern was distributed to herbaria some years ago. It was found by first walking a few hundred feet north along the track to a point opposite the big spring (after which the place was presumably named), then turning northeast and following the route of a long abandoned railroad siding about a thousand feet. Ledges of ferruginous sandstone outcrop here, and toward their northeast end a small spring oozes out. The fern occurs on shaded vertical faces of the rock above this springy place, in moderate abundance. *Mitchella repens* was noted as a close associate, corresponding to the soil being rather dry and strongly acid in reaction. Various indif-

ferent or acid-soil ferns occurred in the vicinity, including a colony of a score of plants of *Botrychium dissectum* var. *tenuifolium* (Underw.) Farw., remarkable in fruiting while of very small size, 7.5 to 15 cm. high over all.—EDGAR T. WHERRY, *Philadelphia, Pa.*

Osmunda cinnamomea, forma **succumbens,** n. f., segmentis ultimis valde imbricatis. In this form the pinnules are wider than the spacing of the sinuses. They are 7.5–8 mm. long and may be as much as 5 mm. wide. As they are only 4 mm. apart from center to center, each pinnule overlaps the next as much as a millimeter. The overlapping portion is in front of the pinnule which is covered. This close spacing makes a beautiful and narrow frond.

Type in the Gray Herbarium, collected by the writer in rich, rocky, fairly moist and shaded ground, Worcester, Massachusetts, June, 1936.—C. W. KINNEY, *Worcester, Massachusetts.*

Thomas N. McCoy has published a list of 40 species of fernworts found in Rowan County in northeastern Kentucky. The most interesting are perhaps *Polypodium polypodioides,* here near the northern limit of its range, *Asplenium Trudelli* Wherry, and *Lycopodium Selago,* var. *patens* (*L. porophilum*). Mr. McCoy also, in another note, records *Botrychium obliquum,* var. *tenuifolium* from Kentucky.[1]

American Fern Society

FIELD TRIP OF SEPTEMBER 27, 1936 AT BRANCHVILLE, NEW JERSEY.—For the second time in two years, Branchville was the appointed place for a joint field trip of the

[1] The Pteridophytes of Rowan County, Kentucky. Jour. So. Appalachian Bot. Club 1: 37 (1936). *Botrychium obliquum.* var. *tenuifolium* in Kentucky, *op. cit.* 1: 63 (1936).

Torrey Botanical Club and the American Fern Society in search of fern hybrids. Despite the repetition, this second trip had as large a turn-out as the first, those attending numbering thirty.

At the start, the first part of the trip was threatened by an insurmountable obstacle—a padlock on the gate where the cars may turn in to drive about a mile through woods and pasture to Big Spring. After a delay in finding out where the key to the padlock was kept, a cavalcade of about a dozen cars drove in. At the stopping-place in the pasture where the plans for the day were being discussed, the group was joined by a most obtrusively friendly cow.

In general, conditions were extremely favorable. The swamp was unusually dry and very different from its spring condition. Fall coloring made numerous low and high bushes of poison sumac decidedly obvious. Plants of one hybrid not found the preceding year were picked up—*Dryopteris cristata* × *marginalis*—but Dowell's *cristate* × *Goldiana* was not discovered.

Later in the day, nine cars traveled through Newton and stopped along the road near a low-lying swamp. This yielded an abundance of *Boottii* (*Dryopteris cristata* × *intermedia*) and several plants of *D. cristata* × *spinulosa*, distinguishably different from *Boottii* and technically checked by its non-granular indusia.

As a matter of record, it may be noted that two large plants of Hart's-tongue, raised at the Brooklyn Botanic Garden, were set out near Big Spring and in what it is hoped may prove a suitable slope of limestone.—R. C. B.

One of those who, in the past, did much to make the Society a success was Mr. Charles H. Bissell, president from 1914 to 1917. His widow, recently deceased, has put the final touch to his work by a bequest of $500. In

order that it may legally receive and administer this and any other bequests which the future may bring in, the Council has taken out Federal incorporation papers; we are now the American Fern Society, Inc.

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ERRATA

Page 16, line 4, for *o.*, read *s.*
Page 73, line 10, for well-rue, read wall-rue
Page 95, line 2, for β, read α
Page 97, line 25, for 1903, read 1803
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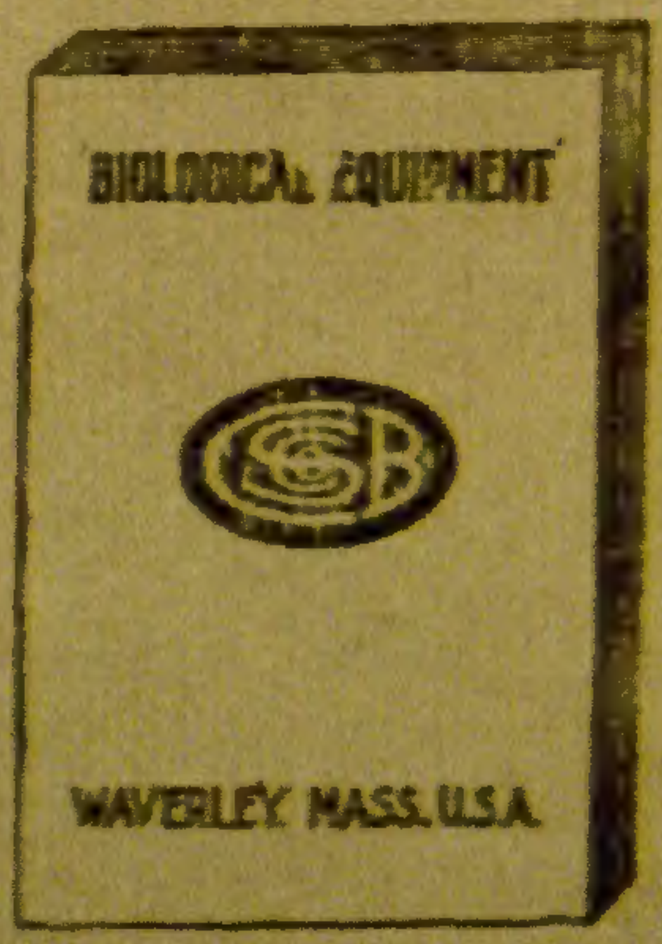

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